HAMPTON ROADS TRANSIT

U.S. Department of Transportation
Federal Transit Administration

Draft Environmental Impact Statement

VIRGINIA BEACH TRANSIT EXTENSION STUDY

Appendix S

City of Virginia Beach Shared Use Path Study—Draft

February 2015

Cover image: courtesy of the City of Virginia Beach

DRAFT

Light Rail Corridor Shared-Use Path Study

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Introduction

With the plans to extend transit from Newtown Road to the oceanfront in the City of Virginia Beach progressing, there is an opportunity to enhance pedestrian and bicycle mobility in an east/west direction along the corridor. The development of this transit corridor could include a system of shared-use paths to connect proposed transit stations and provide a significant pedestrian and bicycle facility either along the corridor or in close parallel proximity. In addition to providing an east-west shared-use path through the City of Virginia Beach and transit station connectivity, this shared-use path system would likely be a catalyst for development and redevelopment along the transit corridor and become a heavily used amenity to the residents and visitors of the City. Six of the City's eight Strategic Growth Areas (SGA's) will be connected by this shared-use path; it will encourage interaction between the various SGA's as they continue to develop.

This project outlines a study of the viability of constructing a shared-use path between the light rail station at Newtown Road and the Norfolk Avenue Trail along the former Norfolk Southern Railroad (NSRR) right-of-way or parallel road rights-of-way. This east/west shared-use path has been identified as a top priority of the City Council-adopted Bikeways and Trails Plan.

At the time of this study, Hampton Roads Transit (HRT) is in the process of developing a Draft Environmental Impact Statement (DEIS) for transit options between Newtown Road and the oceanfront. The DEIS includes light rail and bus rapid transit as two options for the mode of transit. The DEIS end-of-line options include Town Center, Rosemont Road, the oceanfront via the former NSRR, and the oceanfront via the Hilltop area. For the purposes of this study, it is assumed that the mode of transit selected will be light rail.

This study is highly dependent on the cooperation of Hampton Roads Transit (HRT) and their development of the light rail transit (LRT) plans. HRT is a key stakeholder. With the LRT plans at a very preliminary stage, a collaborative effort is critical for the continued planning of this shared-use path and the transit system expansion. During the development of this study, HRT has been engaged for input and feedback, which will continue as this project advances.

This study will be complimented by a supplemental study that will investigate opportunities to enhance pedestrian and bicycle connectivity at the specific transit stations and within the SGA's.

Study Area

The study area for the Light Rail Corridor Shared-Use Path, commonly referred to herein as the "path", generally follows the former Norfolk Southern Railroad right-of-way. The path would start from the LRT station at Newtown Road and extend toward the oceanfront, terminating at the Norfolk Avenue Trail where Birdneck Road and Norfolk Avenue intersect. This study does not include a shared-use path through, or connecting to, the Hilltop area. If that alignment option is selected as the locally preferred alternative (LPA) by the City, a supplemental study will be needed to incorporate that area.

For purposes of this study, the corridor was divided into three sections: Newtown Road to Town Center, Town Center to London Bridge Road, and London Bridge Road to the Norfolk Avenue Trail. These sections are based on manageable study areas and are not intended to suggest, or follow any construction phasing of the transit extension.

Plan Objective

A shared-use path operates as an off-road transportation facility that complements a roadway and transit network. The Light Rail Corridor Shared-Use Path will utilize the existing NSRR right-of-way to transform an abandoned railroad track site into a usable, community asset, and ultimately an enhancement to surrounding development. This will create a more inviting environment for pedestrians, bicyclists, and transit users to support a flourishing transportation system along the corridor as well as provide an additional amenity for future transit oriented development (TOD). The objective of this study is to determine if a shared-use path is a feasible and implementable option within the constraints of existing conditions and proposed developments.

Goals

The primary goals driving this study are to:

- Determine if the addition of shared-use path along proposed light rail track alignment is feasible
- Create a continuous east/west pedestrian and bicycle shared-use path between Newtown Road (the western City of Virginia Beach limits) and the oceanfront
- Create a facility to connect Strategic Growth Areas
- Construct a pedestrian and bicycle friendly connection between proposed transit stations
- Supplement urban development with modes of transportation that serve pedestrian traffic
- Allow the shared-use path to serve as maintenance access to the transit system
- Identify conceptual planning-level opinion of probable costs

Confines

This study is confined to the limits of the existing NSRR right-of-way, and to the alignment of the proposed LRT. By direction from the City, the Laskin Road/Hilltop alignment alternative was not considered. For the purpose of this study, the transit mode is assumed to be light rail. This is the most conservative approach, as other modes of transit would generally have a smaller footprint than light rail. The safety setbacks and clear zone dimensions were developed based on the light rail design guidelines prepared by HRT.

Figure 1: Section 1 - Newtown Road to Town Center

Figure 2: Section 2 - Town Center to London Bridge Road

Figure 3: Section 3 - London Bridge Road to Norfolk Avenue Trail

Existing Conditions

Opportunities

The City of Virginia Beach purchased the right-of-way previously owned by Norfolk Southern Railroad in anticipation of the extension of transit from the Norfolk/Virginia Beach city line at Newtown Road to the oceanfront. The former NSRR right-of-way extends from Newtown Road (where the existing Norfolk LRT system ends), to Birdneck Road at Norfolk Avenue. There is an existing shared-use path that has been constructed adjacent to Norfolk Avenue that continues eastward to Pacific Avenue at the oceanfront. This right-of-way is generally 66 feet wide. In addition to the former NSRR right-of-way, the City of Virginia Beach has also purchased an additional parcel adjacent to the transit corridor at Independence Boulevard. This parcel is referred to as the old Circuit City parcel and currently is being leased by a car dealership.

This transit corridor provides a straight swath of land through the entire city from west to east. The corridor, and the transit system within it, are critical pieces of the City's future redevelopment plans. Six of the eight SGA's are along this corridor; TOD is an element of each of those six plans. A key east/west path that supports bicycle and pedestrian traffic while connecting to six SGAs supports their vision. A significant opportunity provided by the former NSRR right-of-way is the safe environment it creates for users of the path, being removed from the mix of vehicular traffic and managed roadway crossings.

Construction of the extension of light rail from Newtown Road to Town Center is another opportunity. Funding has been committed by the State of Virginia towards the extension of light rail that will connect downtown Norfolk with Virginia Beach's downtown. The City of Virginia Beach will complete the funding so that no federal funding is necessary for the construction. The current schedule projects revenue collection to begin in 2018. If it is determined that a shared-use path is feasible, the portion between Newtown Road and Town Center could be constructed as part of the light rail extension construction.

Constraints

The most restrictive features controlling the placement of the transit line and shared-use- path are the Dominion Virginia Power (DVP) transmission poles located along the corridor and within the former NSRR right-of-way. The cost of moving these transmission structures is prohibitive, forcing the alignment of the transit rail to be designed with sufficient clearance from the poles both horizontally and vertically. Therefore, the transit alignment is not centered in the existing right-of-way, but offset to avoid conflicts with the transmission poles. This, in turn, drives the location and cross sectional dimensions of any shared-use paths within the existing right-of-way.

Other utilities exist within the transit corridor. In addition to the Dominion Virginia Power transmission poles, there are Dominion Virginia Power distribution poles and lines paralleling the length of the right-of-way. In addition, major underground utilities exist. A City of Virginia Beach 48"/42" water main, and Hampton Roads Sanitary District (HRSD) 36" force main are obstacles to proposed rail structural elements and underground storm drainage necessary for the transit line and the shared-use path.

Stormwater management will be a constraint since the conceptual LRT plans developed by HRT are utilizing the linear ditches to provide pollutant removal. A closed-drainage system will be required to allow the shared-use path to fit within the right-of-way. Therefore, the linear stormwater treatment is less viable and other treatment measures may be required. It is anticipated that additional property will need to be acquired adjacent to the former NSRR right-of-way to accommodate stormwater management.

Dominion Virginia Power Offset Requirements

Generally, the clearances required by Dominion Virginia Power are as outlined in **Table 1**. The clearances are based upon maximum sag of conductors, which changes based on operating and ambient temperatures as well as wind loading. The lines along the shared-use path corridor are 230 kV. Through discussions with DVP, they have offered to review the conceptual design developed by HRT, and provide comments on horizontal and vertical offsets to their facilities.

Table 1

	Radical Clearances in Feet*		
	115kV	**230 kV**	500 kV
Railroads	31.5	**33.5**	39
Lights	17	20	26

**Radial Clearances are measured from the conductors based on 60 degrees F ambient temperature and 48-49 mph wind load.*

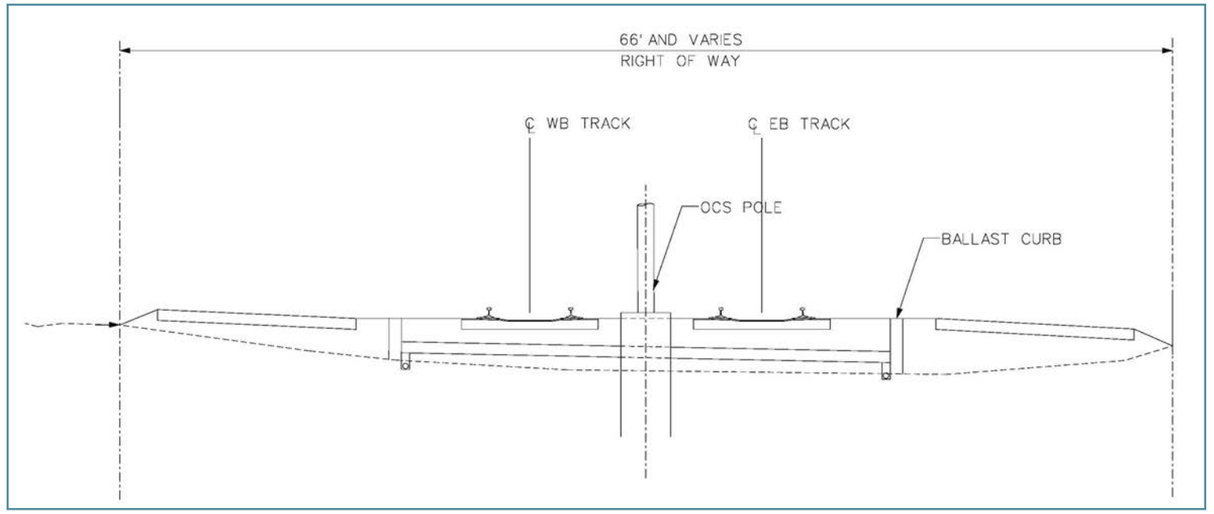


Figure 4: Ballast Curb

Gathering Information

Constructed Example

To develop an understanding of light rail track and shared-use pathway systems that have been implemented successfully, the LYNX project in Charlotte, NC was visited and studied. In the LYNX system, right-of-way and space constraints led to the use of ballast curb, and in some instances, non-standard practices were acceptable.

Ballast curb, as detailed in **Figure 4**, is a standard practice when right-of-way is limited. Although there is added construction cost, ballast curb allows the reduction or elimination of slopes that occupy valuable right-of-way. In some cases, the cost of additional right-of-way acquisition offsets the added construction cost. **Figures 5** and **6** illustrate the ballast curb section.

To accommodate drainage, the LYNX system utilizes underdrains to transport water to appropriate outfalls. This closed drainage system model is an attractive solution for constrained spaces, but has a higher construction cost than an open conveyance system using ditches.

The LYNX system initially viewed their multi-use path as a means to provide connectivity to stations. However, the multi-use path has proven to be a tremendous amenity for the community. The multi-use path has helped to spawn development, provided a means for connecting development, and created a passive recreational asset. The way the development community has embraced the path as a value-added amenity demonstrates the success of the LYNX pathway system, as shown in **Figures 7** and **8**.

Collecting Existing Data

Base mapping used for this study is a compilation of accessible GIS information, and the conceptual LRT survey and design plans being developed for the DEIS provided by HRT. Both the horizontal and vertical LRT alignments were used in the development of the shared-use path's typical sections, alignment, and profiles.

Alternatives Development

Stand-Alone Project

To develop the shared-use path as a project that has the ability to be constructed with or without development of transit along the corridor, it is important to consider the effects each mode of transit poses to one another.

If transit is not developed, the proposed shared-use path would be solely a 14-foot path from Newtown Road to Norfolk Avenue Trail. Although this opens the opportunity to use the 66-foot right-of-way to meander the path, the path would be constructed in a generally straight, east/west alignment to provide the opportunity for transit to be developed in the future. If the 14-foot shared-use path exists before transit is developed, care will need to be taken to preserve its condition during the construction of transit. Planning will need to be done to manage a restricted work zone, coordinate construction ingress and egress, and keep the shared-use path operational.

If transit is developed, the typical section will have added features that would otherwise be unnecessary if that path did not exist. For example, the use of ballast curb to optimize space is only required if the limited 66-foot former NSRR right-of-way is to include a

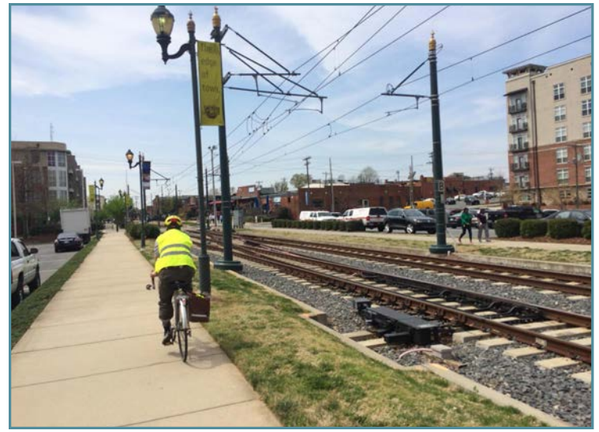


Figure 5: Charlotte LYNX System - Ballast Curb

Figure 6: Charlotte LYNX System - Ballast Curb

Figure 7: Charlotte LYNX System - Asset to Development

Figure 8: Charlotte LYNX System - Asset to Development

transit corridor and shared-use path. Additionally, space constraints require shallow swales with underground drainage versus open track-side ditches. A 5-foot sidewalk would also need to be constructed to provide connectivity to the shared-use path across the transit line.

Typical Section Alternatives

Meetings with City staff were held to define the design parameters and gain an understanding of the City staff's desires and objectives. As a starting point, the team began using the following parameters to develop initial concepts:

- 12-foot path width is desirable
- 10-foot minimum path width for maintenance vehicle access
- Paths on both sides of LRT
- Closed drainage system would probably be necessary to accommodate the transit and shared-use paths

In addition to those guidelines, AASHTO standards for shared-use paths are as follows:

- 10-foot minimum path width
  - 11-foot minimum for bicyclists and pedestrian use with option to pass
- 2 foot minimum graded buffer
  - 3 to 5-foot desired
  - 1V:6H maximum cross slope
- 2 percent maximum path cross slope
  - 1 percent cross slope desired
  - minimum 5-foot transition length per each 1 percent change in cross slope
- 5 percent maximum grade or match adjacent roadway grade

Throughout the majority of the corridor, the former NSRR right-of-way is 66 feet wide. Early concepts that were developed revealed that in order to achieve the desirable 12-foot path widths, without realigning HRT's conceptual LRT horizontal alignment, the 12-foot path would be outside of the right-of-way on one side. See **Figure 9**.

The DVP transmission poles and line locations drive the location of the transit rail due to clearance requirements. HRT has used a minimum 12-foot offset from the transmission poles to locate the closest rail. Due to the location of the transmission poles and subsequent rail locations, the rail is not centered in the 66-foot right-of-way. This caused a portion of one of the 12-foot paths to be outside of the existing right-of-way.

Other options were investigated and resulted in an option with a 14-foot wide shared-use path on one side only (south side of the rail line). Reducing the facility to one 14-foot path, on one side only, allowed for the inclusion of open ditches on either side of the path to accommodate drainage. This typical section is shown in **Figure 10**.

One of the City staff's desires is to have connectivity between transit stations on both sides of the transit tracks. Another option was developed as a hybrid between the first two options. This typical section is pictured in **Figure 11**. Based on right-of-way restrictions, a 12-foot path was not feasible on the north side of the LRT alignment. However, along most of the corridor, a 5-foot sidewalk could be accommodated. The restricted width constrains the north side to use as a sidewalk; however, the value this adds in accessibility for pedestrian traffic coming from the north side is important. On the south side, the right-of-way allowed for a 14-foot path to run along the majority of the corridor. Having one, consistent shared-use path on one side of the LRT alignment would provide for connectivity between the transit stations and SGA's and provide continuity throughout the City. This typical section was the most desirable of the developed alternatives. This section was applied in developing the layout of the multi-use path for the three studied corridor sections.

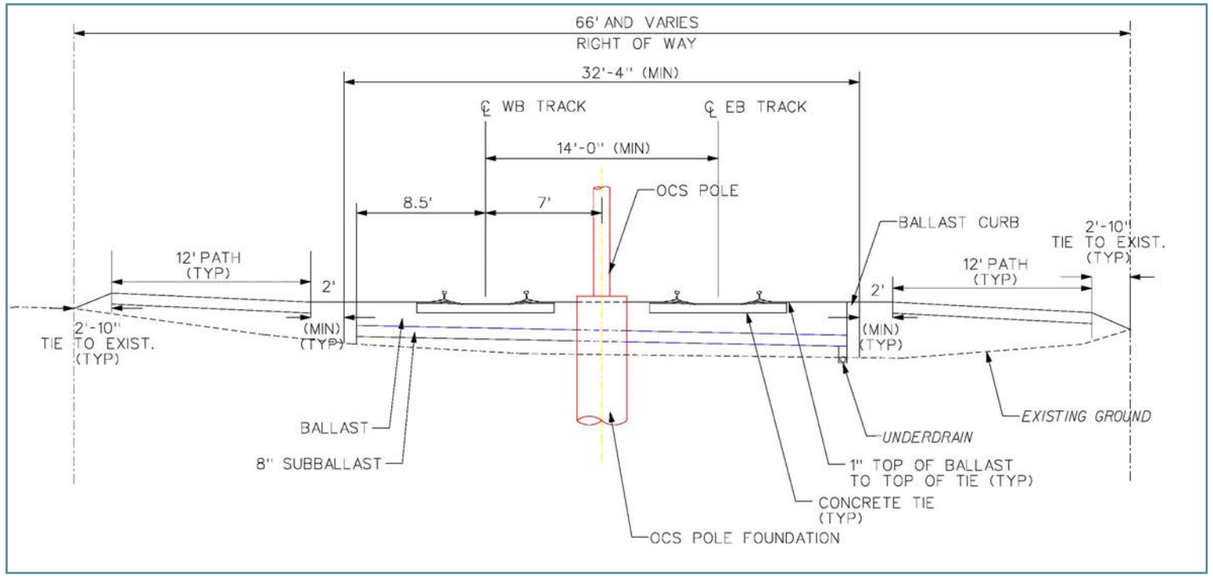


Figure 9: Typical Section - two 12-foot wide shared-use paths

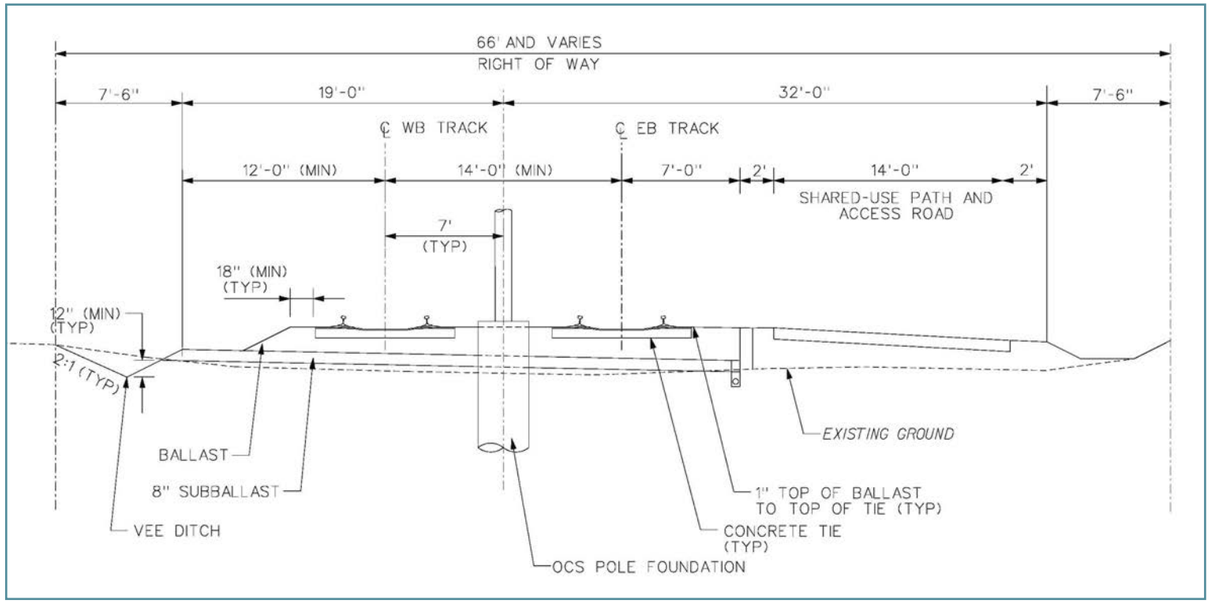


Figure 10: Typical Section – one 14-foot wide shared-use path

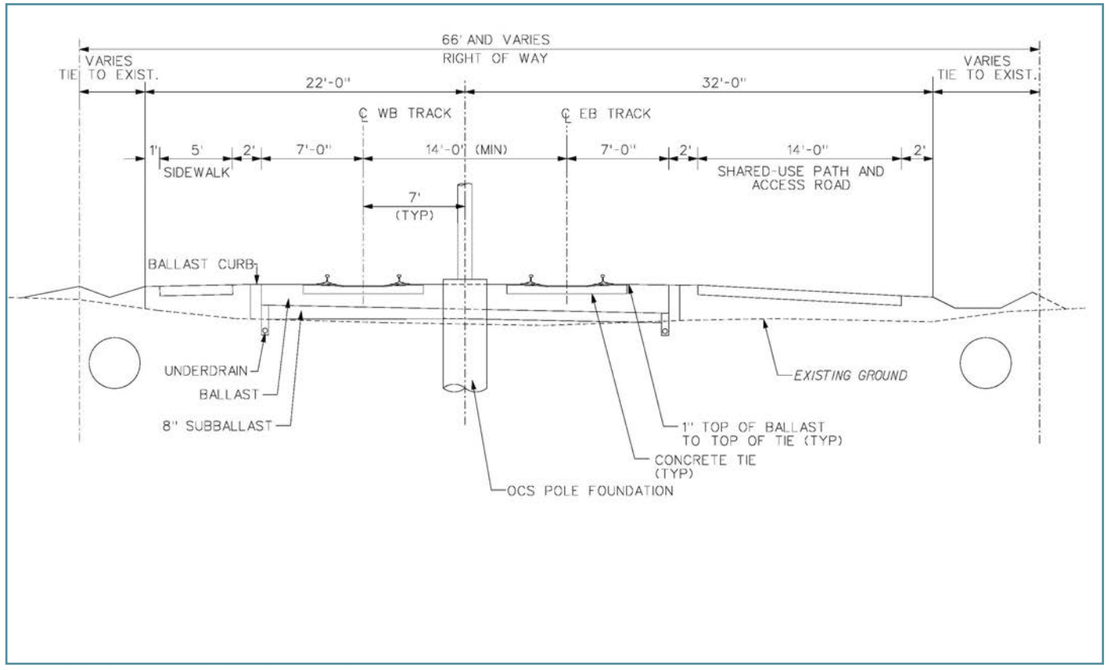


Figure 11: Typical Section – one 5-foot sidewalk and one 14-foot shared-use path

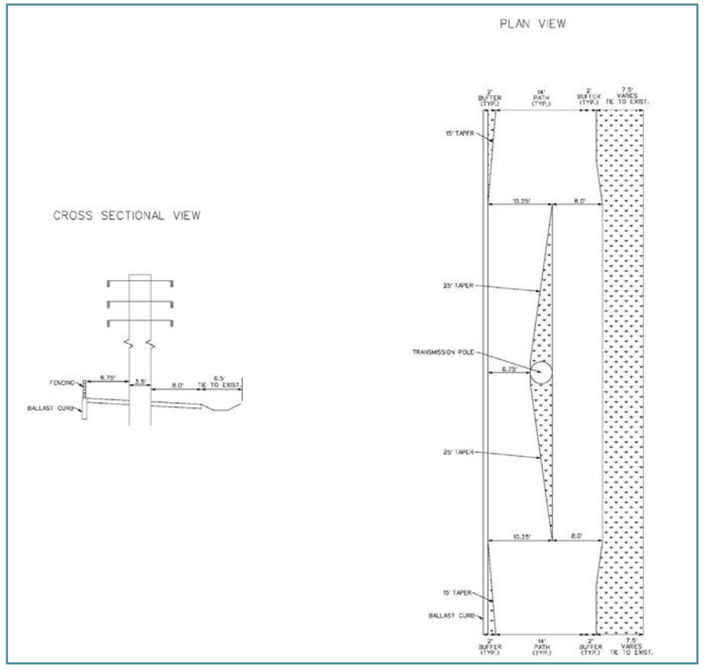


Figure 12: Pole between Newton and Princess Anne

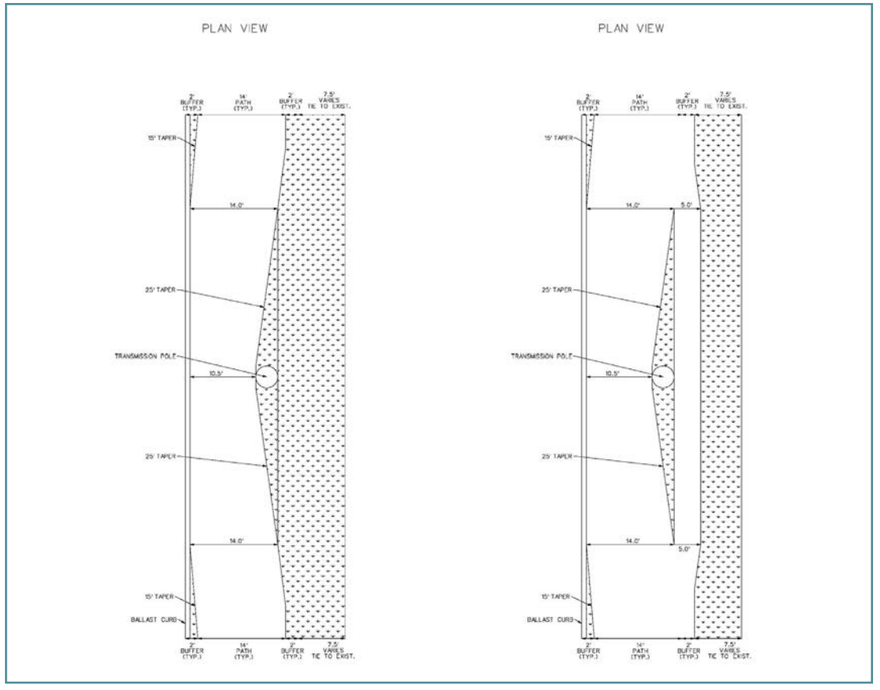


Figure 13: Pole between Princess Anne and Lowther Drive

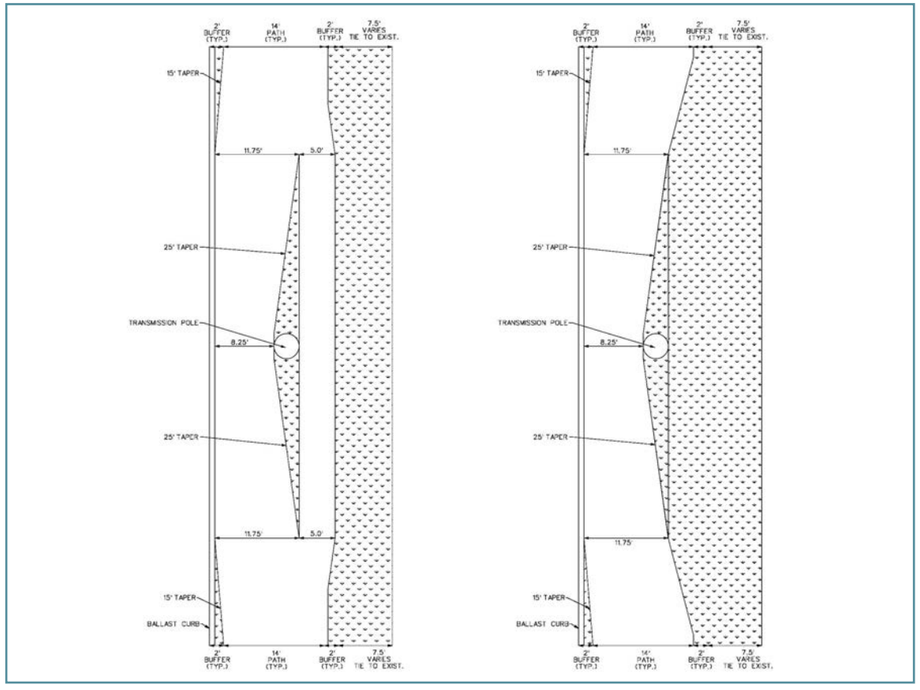


Figure 14: Pole between S. Kentucky Avenue and Lynn Shores Drive

Accommodating Transmission Poles in Pathway

Although the light rail track was set at a minimum horizontal clearance from the transmission poles, the poles are within the right-of-way. In many cases, the placement of the 14-foot shared-use path coincides with the transmission pole placement. Options were developed that split the path around existing poles. It was determined that a minimum paved width of the shared-use path would be 10 feet. In situations where the shared-use path would "split" around a transmission pole, a minimum walkway width of 4 feet will be provided. **Figures 12** through **14** show various treatment options of the shared-use path "splitting" around a transmission pole. These options allow for a minimum of 10 feet of pavement to accommodate a City or HRT maintenance vehicle. Based on the geometrics at any specific transmission pole location, some amount of buffer or path-side ditch will need to be paved. Taper lengths for the "split" transitions were determined according to the VDOT Road Design Manual under the assumption of a 15 mile-per-hour speed.

Stormwater Management Opportunities

It was recognized early that stormwater management will be a major concern of this project since the conceptual HRT plans show intentions of using track-side open ditches for linear stormwater treatment. Since the typical section proposed with this shared-use path study reduces the amount of track-side open ditches, other stormwater treatment methods must be considered.

This project will not be grandfathered under Part IIC of the Technical Criteria for Regulated Land-Disturbing Activities: (9VAC25-870-93), and will need to follow the current regulations commonly referred to as Runoff Reduction, Part IIB (9VAC25-870-62). The current regulations favor water treatment at the source by means of infiltration; therefore the preferred best management practices (BMPs) will likely incorporate some form of infiltration. Some opportunities for BMPs include:

- **Permeable pavement**
  If the 5-foot sidewalk and 14-foot path were to be constructed with permeable pavement, the entire sidewalk and path could be infiltrated. This allows the stormwater runoff to begin being treated at the source. This is a viable engineering solution but would require routine maintenance by the City.
- **Infiltration strip under a landscaped buffer**
  Along the corridor, a 2-foot landscaped buffer will run between the LRT track and the path. By placing a stone infiltration strip beneath the landscaped buffer, water will be allowed to infiltrate along the strip. This design would need to allow the water to reach existing underground sand layers for infiltration to occur. Infiltration also requires that two forms of pretreatment be used; a grass filter strip and upper sand layer would likely be chosen. More analysis will need to be done to determine the depth of the stone layer, as well the depth of the existing sand layers. In this

scenario, the path would need to have a cross-slope directing water toward the infiltration strip; this would mean sloping the path toward the LRT track.

- **Linear dry/wet swales**
  In areas where right-of-way is not restrictive, linear swales can be designed to treat and transport water to outfall locations.
- **Linear bioretention**
  There is the possibility of including a linear bioretention system when the right-of-way does not restrict the minimum required surface area. The system would fit between the outside edge of the path and the right-of-way limit. This design will only be appropriate in areas where there is a minimum of two feet of separation between the bottom of the bioretention media, or underdrain, and the seasonally high groundwater table elevation. An underdrain will be necessary in areas where the soil does not have adequate infiltration rates.
- **Land acquisition for BMPs at outfalls**
  Although not preferred under the runoff reduction methodology, ponds or other BMPs that require land area could be constructed near identified outfalls. This would require the acquisition of land or permanent drainage easements to construct and maintain the facilities. To transport the stormwater runoff to the outfalls, ditches would be required. In cases where right-of-way is restrictive, this may require permanent easements to be acquired.

It may be possible that one of these BMP's will not adequately meet the stormwater management requirements on its own, so a combination of these methods may be required. In the selection of the best practice for drainage design, it will be important to understand the existing soils along the corridor. A cost-benefit analysis will also need to be conducted to understand the value of each solution.

Throughout the development of the recommended drainage design, the shared-use path will be designed to have the option to be implemented as a stand-alone project. Because of this, the cross-slope of the pathway will need to drain away from the proposed transit alignment to prevent standing water. This requirement leads to the recommendation in most cases to be the use of linear dry or wet swales. The addition of permeable pavement is recommended as a supplemental option if dry or wet swales are not sufficient.

Horizontal Alignment

As stated previously, the length of the study was divided into three sections to make it more manageable. The sections include:

- **Newtown Road to Town Center –** Extension of LRT from its current terminus at the Newtown Road Station in Norfolk to Constitution Drive in the Town Center area of Virginia Beach. Although a specific station location has not been selected for Town Center, the eastern most option is at Constitution Drive. This section is approximately 3.0 miles in length.
- **Town Center to London Bridge Road –** This section begins at Constitution Drive and extends to London Bridge Road where one of the HRT alternatives for the extension of transit splits to the north to the Hilltop area. The section spans approximately 4.7 miles.
- **London Bridge Road to Norfolk Avenue Trail –** The study continues along the former NSRR right-of-way and terminates at the Birdneck Road/ Norfolk Avenue intersection where the path will connect with the existing Norfolk Avenue Trail. If the Hilltop Alternative is selected as the locally preferred alternative (LPA), it is anticipated that a shared-use path would continue in the former NSRR right-of-way between London Bridge Road and Birdneck Road. Along this anticipated alignment, the path stretches about 2.8 miles.

Newtown Road to Town Center

From Newtown Road to Town Center, the former NSRR right-of-way is generally straight, running east/west. The majority of the corridor runs through developed areas – commercial, industrial, and residential. See Sheets 1 through 10 for a more detailed layout of this section.

Strategic Growth Areas

The westernmost end of the project corridor, near Newtown Road, is a part of the City of Virginia Beach's Newtown SGA. The Newtown SGA extends through Greenwich Road, bordered on the east by Interstate 264. According to the SGA plan, the vision for this area is to create a mixed-use village center, business parks, an educational campus, new light industrial space, and new residential neighborhoods. The guiding recommendations for this SGA include creating interconnected pedestrian and street frameworks, building mixed-use and transit-oriented development, and extending a bicycle and trail system through the site; all of these align with the implementation of a shared-use path.

The next designated area is the Pembroke SGA. The Pembroke SGA extends along the project corridor starting on the east side of Interstate 264, and stretches through Town Center to the west bank of Thalia Creek. The plan for the vision of this SGA is to be a central urban core with a vertical mix of urban uses. Mobility and transit alternatives are included in these uses. The recommendations established in the Plan include implementing transit-oriented development around planned transit stations; a shared-use path would effectively enhance transit-oriented development and pedestrian mobility.

Street Crossings

The first section of this project, from Newtown Road to Town Center, incorporates at-grade, skewed, elevated, and mid-block street crossings. The first major intersection that the shared-use path will cross is Newtown Road. This crossing will take advantage of the existing signal at the Curlew Drive/Newtown Road intersection to control pedestrian and bicycle traffic moving through the intersection.

The next significant intersection is at Princess Anne Road. The existing NSRR track crossing infrastructure, distinguished as exempt, is set-up as a mid-block crossing. According to Section 4C.05 of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), a Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is heavy enough that pedestrians experience excessive delay in crossing the major street. The MUTCD outlines how to identify a location that has a need for a controlled pedestrian crossing; further analysis of each proposed mid-block crossing location will be needed as the shared-use path project progresses. There will be rail crossing signals at this location with gates that lower when a train approaches. This will allow pedestrians and bicyclists to cross Princess Anne Road at the same time as the light rail trains cross.

Freight Lane is a minor street that is just east of the Princess Anne crossing. It will be an at-grade crossing with the shared-use path parallel to the track. The traffic volumes on Freight Lane are low and no specific traffic control will be used for the pedestrians and bicyclists other than stop signs on the paths.

The next street crossing heading east is South Lowther Drive. This is a two-lane road that serves a Dominion Power facility north of the light rail tracks. The Dominion Power facility has access from Greenwich Road and the conceptual HRT plans show this crossing to be closed south of the tracks. Therefore, the shared-use path will not be in conflict with vehicles at this location.

Before the Greenwich Road crossing, right-of-way constraints on the north side of the LRT tracks force the 5-foot sidewalk to be eliminated. Bicycle and pedestrian traffic will cross the LRT tracks using a Z-crossing as seen in **Figure 15**. A Z-crossing is channelized, controlled pedestrian movement designed to promote safety. As recommended by FHWA, the design of a Z-crossing forces a pedestrian to turn toward an approaching transit vehicle before they cross each track. This configuration helps to ensure that

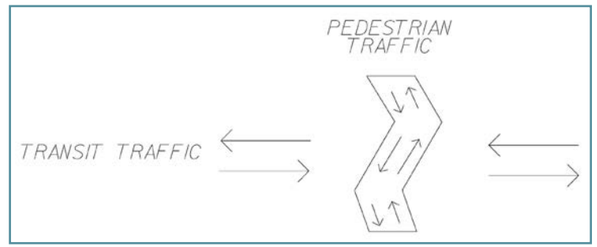


Figure 15: Z-Crossing Schematic

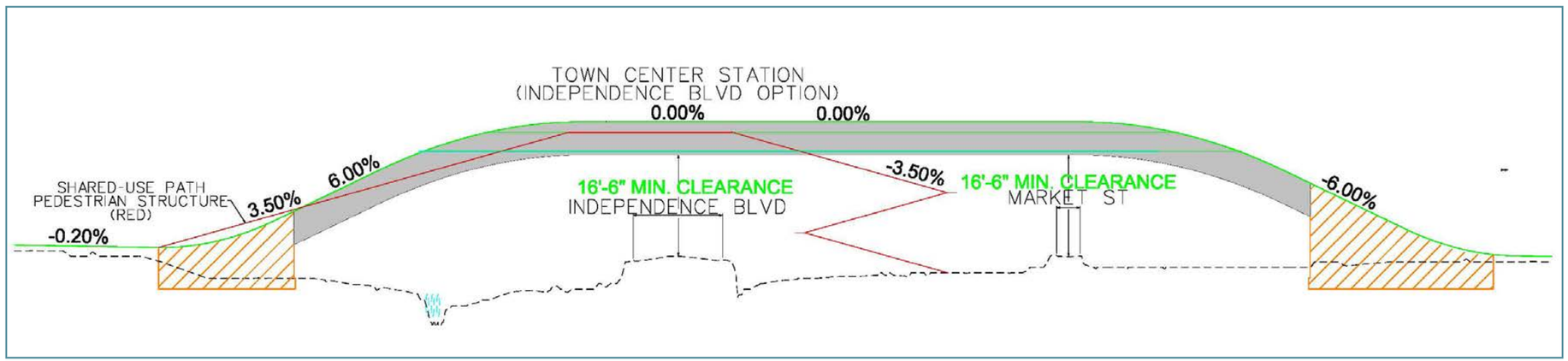


Figure 16: Profile of Pedestrian Crossing Over Independence Boulevard

Figure 17 : Layout of Pedestrian Crossing Over Independence Boulevard with Ramp to Market Street

pedestrians are aware of any oncoming traffic before proceeding to cross. A mid-block crossing will be used for the 14-foot shared-use path at Greenwich Road. There will be rail crossing signals at this location that will warn motorists of approaching trains. This will allow pedestrians and bicyclists to cross Greenwich Road at the same time as the light rail trains cross. At other times, there will be stop signs on the shared-use path to control pedestrians and bicyclists as they cross Greenwich Road. As a part of the design of improvements to Interstate 264, there is a new Greenwich Road overpass of Interstate 264 planned. When this occurs, existing Greenwich Road will become a cul-de-sac east of the rail crossing and traffic volumes will drop significantly.

The shared-use path will continue parallel to the tracks and under the elevated Interstate 264 crossing until South Witchduck Road. At South Witchduck Road, traffic from the shared-use path will cross the LRT tracks using a Z-crossing, and continue north to the signalized intersection at Witchduck Road, the on-ramp to Interstate 264, and Southern Boulevard (which is the access to the Witchduck Transit Station). This intersection will be signal-controlled and the shared-use path will be at-grade. Pedestrian traffic from the shared-use path will continue through the intersection, and continue along the 5-foot sidewalk until reaching the nearest transit station. Bicyclists will use the pavement for Southern Boulevard to access the continuation of the 14-foot shared-use path.

Pennsylvania Avenue and Dorset Avenue are minor streets east of the Witchduck Road crossing that provide access to industrial facilities. These will be at-grade crossings with the shared-use path parallel to the track. The traffic volumes on the two minor streets are low and no specific traffic control will be used for the pedestrians and bicyclists other than stop signs on the paths.

The next major intersection is with Euclid Road. At this location, the shared-use path will cross Euclid Road at a skew. Holland Drive, Southern Boulevard, and Opal Avenue also converge near this point. The HRT light rail project proposes to realign the intersections both north and south of the rail crossing. Since none of the intersections in this vicinity are signal-controlled, a mid-block crossing has been identified as the best approach to safely cross Euclid Road with the shared-use path traffic. The 14-foot shared-use path and 5-foot sidewalk will be stop-sign controlled.

The shared-use path and sidewalk also cross Kellam Road. This will be a mid-block crossing, as the former NSRR tracks cross without a controlled traffic signal. Shortly after crossing Kellam Road, the alignment of the path curves to the north to avoid conflicts with the Dominion Power transmission lines. Because of this, there is not space within the right-of-way to continue the 5-foot sidewalk on the north side of the LRT tracks. A Z-crossing will be used to shift bicycle and pedestrian traffic to the 14-foot shared-use path on the south side of the LRT tracks.

The crossing over Independence Boulevard required special attention. As the 14-foot shared-use path approaches Independence Boulevard, the path will begin to elevate. The LRT track and shared-use path will both be grade separated structures at this location. Although each requires a 16.5-foot clearance over Independence Boulevard, the two structures will be separate due to the different requirements for LRT versus pedestrians/bicyclists. The shared-use path will begin to elevate approximately 600 feet west of Independence Boulevard. The maximum grade for the shared-use path will be 3.5%.

After crossing Independence Boulevard at the minimum required 16.5' clearance above the roadway, the pedestrian structure will begin to decline at a 3.5% grade. To bring the shared-use path traffic back to grade before Market Street, an ADA compliant two-level pedestrian ramp was incorporated. If the path remained straight, the ramp would meet existing ground immediately before Market Street, without sufficient room to stop safely. The implementation of the pedestrian ramp allows for walkers and bicyclists to return to ground level at a safe speed and with ample room to stop before crossing Market Street. The ramp runs at a 3.5% grade and changes direction twice with more than 200 feet in each direction, as shown in **Figure 16**. The pedestrian ramp incorporates a full 14 foot path width. This design provides a safe and effective path for walkers and bicyclists to safely cross over Independence Boulevard and cross Market Street at grade.

There is a potential that the Town Center transit station will be located at Constitution Drive. The shared-use path crosses Constitution Drive mid-block. Pedestrian and bicycle traffic on the paths will be stop-sign controlled unless there is a train present. When a light rail vehicle is crossing, the shared-use path traffic can cross Constitution Drive.

Transit Stops

The pathway will start at the existing transit station at Newtown Road, near the City of Virginia Beach limits. The next proposed transit stop is the Witchduck Station, located to the east of Witchduck Road near Jersey Avenue. The third stop in this series is proposed to be located in the Town Center area. The location of the station in Town Center has not yet been determined. The options being investigated in the HRT DEIS are:

- Elevated over Independence Boulevard
- Elevated over Market Street
- At –grade west of Constitution Drive

Each option offers opportunities and constraints; this decision is being evaluated by HRT and the City and will be determined at a later date along with the LPA decision. Pending the final decision for placement of the Town Center station, the path layout in the Town Center area may be revisited.

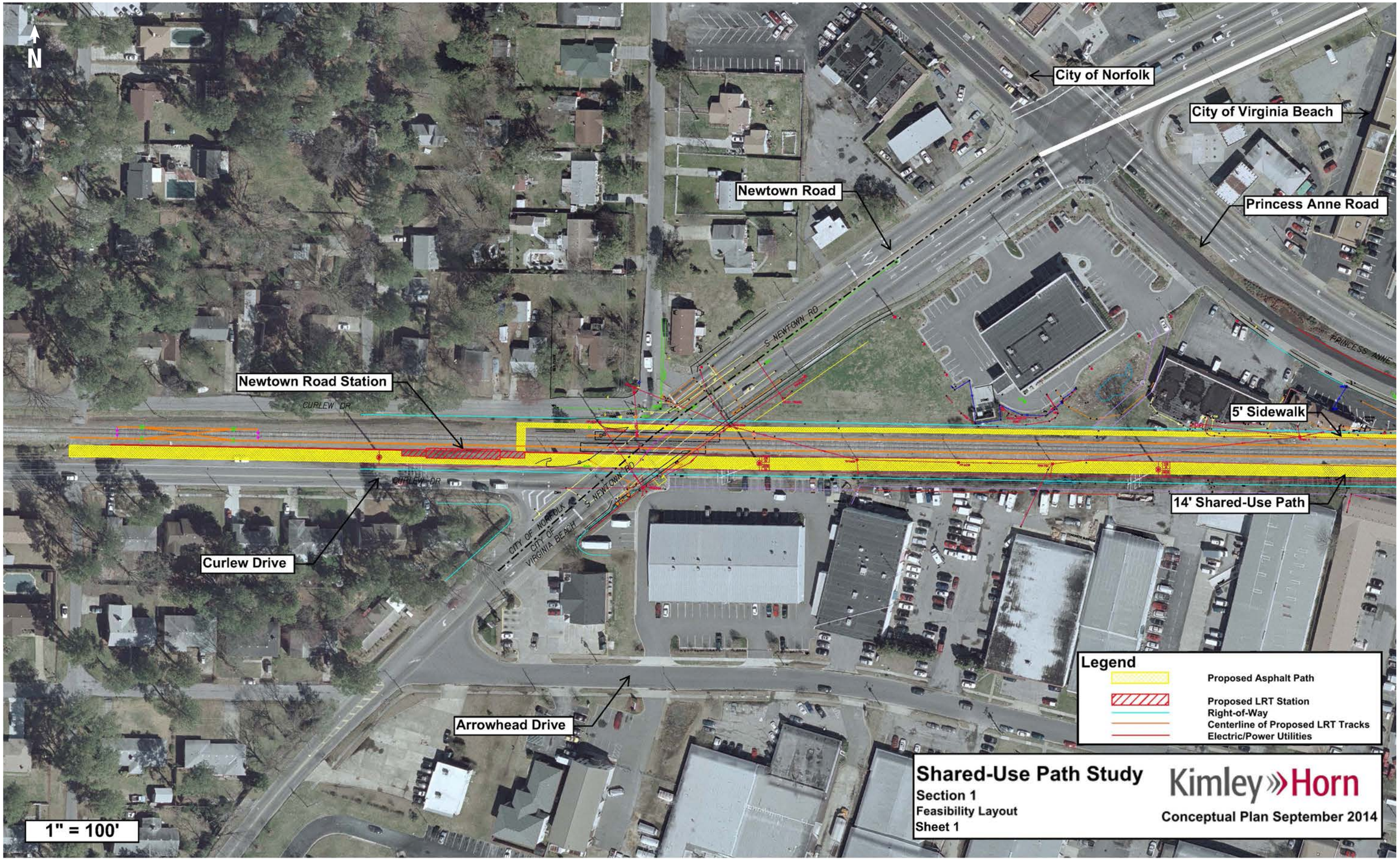
Drainage

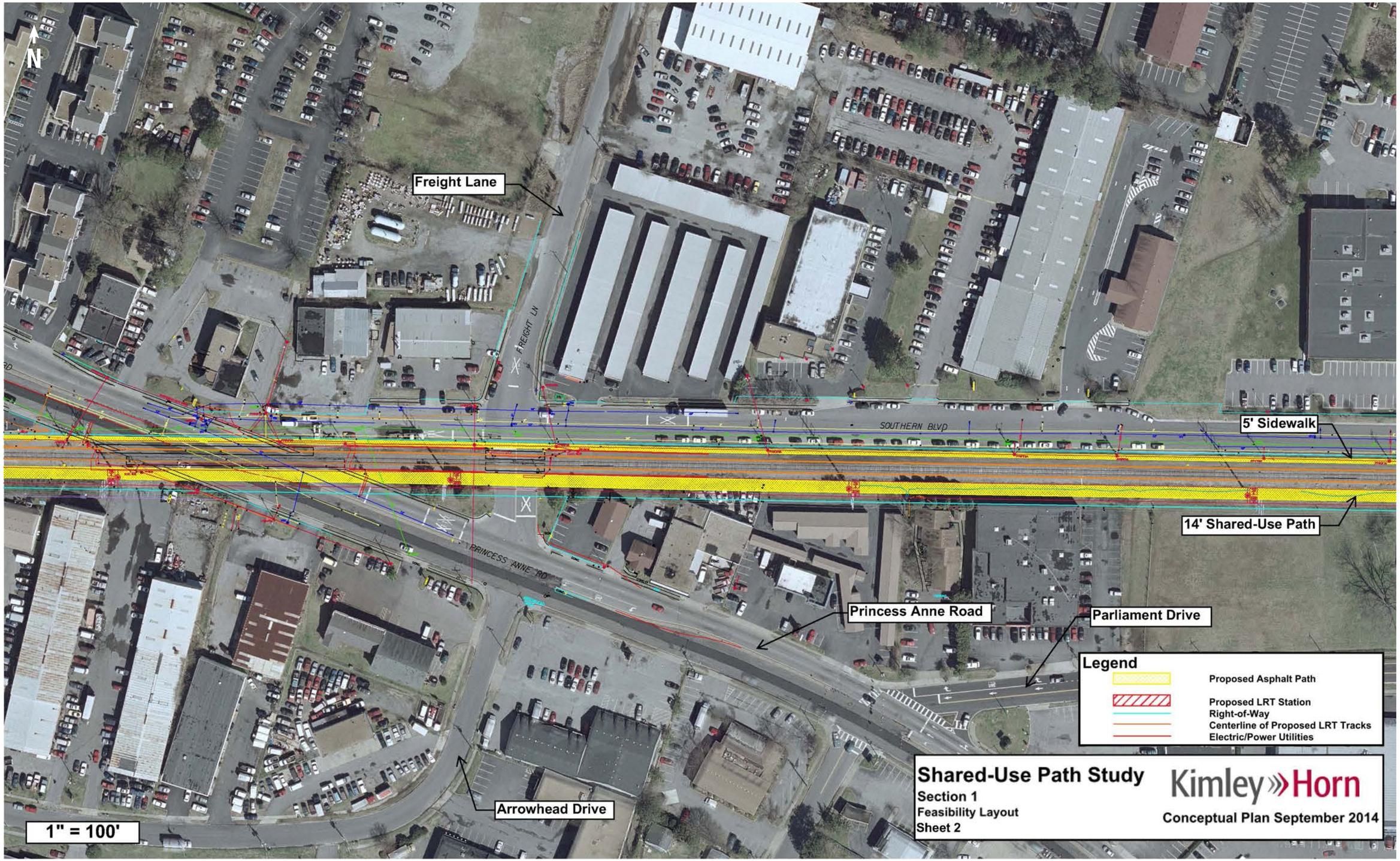
In the development of the shared-use path, it is important to consider the facility as a stand-alone project. If the development of transit does not occur, the path should be able to operate as a functional bicycle and pedestrian facility. Along the majority of the corridor, the former NSRR right-of-way includes ditches along either side of the railroad tracks. Generally, there is 10 feet or more between the edge of the path and the right-of-way limit. However, in various locations, this existing ditch may be paved over by the path. In these cases, improvements to the drainage system will be required.

To identify outfalls for this section of the project, further studies will need to be conducted. Information and detail beyond conceptual plans need to be developed to identify off-corridor stormwater management. To transport stormwater runoff to each outfall, shallow wet or dry swales with an underground piped drainage system may be needed. Wet or dry swales will help to account for water quality and quantity. Rock check dams may also need to be used to meet quantity requirements. If this BMP is not sufficient, permeable pavement is an option as a supplemental BMP.

Preliminary Opinion of Probable Cost

Based on the conceptual level study, it is expected that the construction cost of the shared-use path facility for 3.0 miles from Newtown Road to Town Center will be about $15.7 million. This includes the estimated $7.3 million elevated structure over Independence Boulevard. On a cost per mile basis, this section comes in at roughly $5.2 million per mile.


N
City of Norfolk
City of Virginia Beach
Newtown Road
Princess Anne Road
Newtown Road Station
5' Sidewalk
14' Shared-Use Path
Curlew Drive
Arrowhead Drive
1" = 100'
S. NEWTOWN RD
CURLEW DR
PRINCESS ANNE
CITY OF NORFOLK
CITY OF VIRGINIA BEACH
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 1
Kimley»Horn
Conceptual Plan September 2014


N
Freight Lane
FREIGHT LN
SOUTHERN BLVD
5' Sidewalk
14' Shared-Use Path
PRINCESS ANNE RD
Princess Anne Road
Parliament Drive
Arrowhead Drive
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 2
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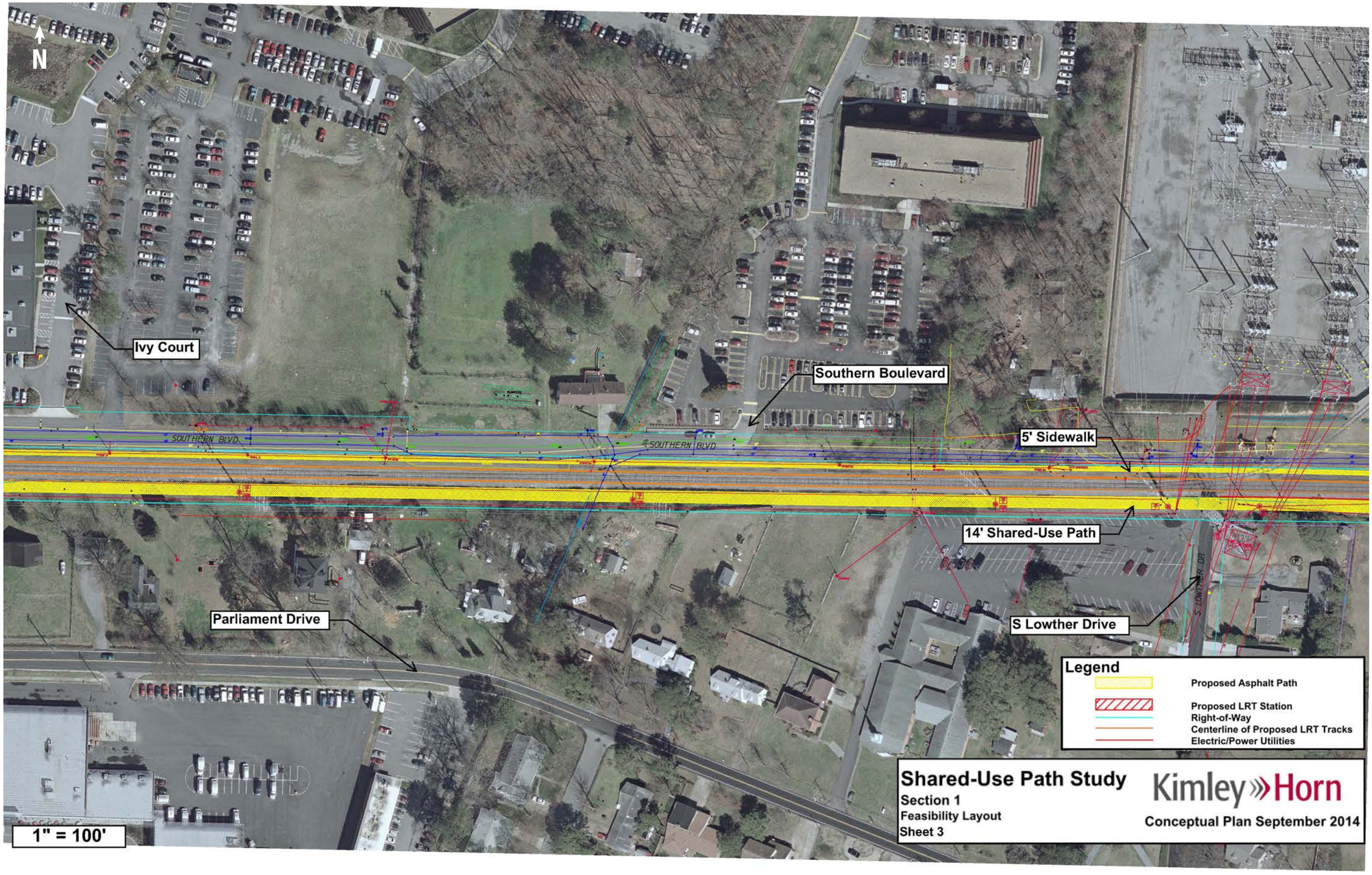
N
Ivy Court
Southern Boulevard
5' Sidewalk
14' Shared-Use Path
S Lowther Drive
Parliament Drive
SOUTHERN BLVD
SOUTHERN BLVD
S LOWTHER DR
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 3
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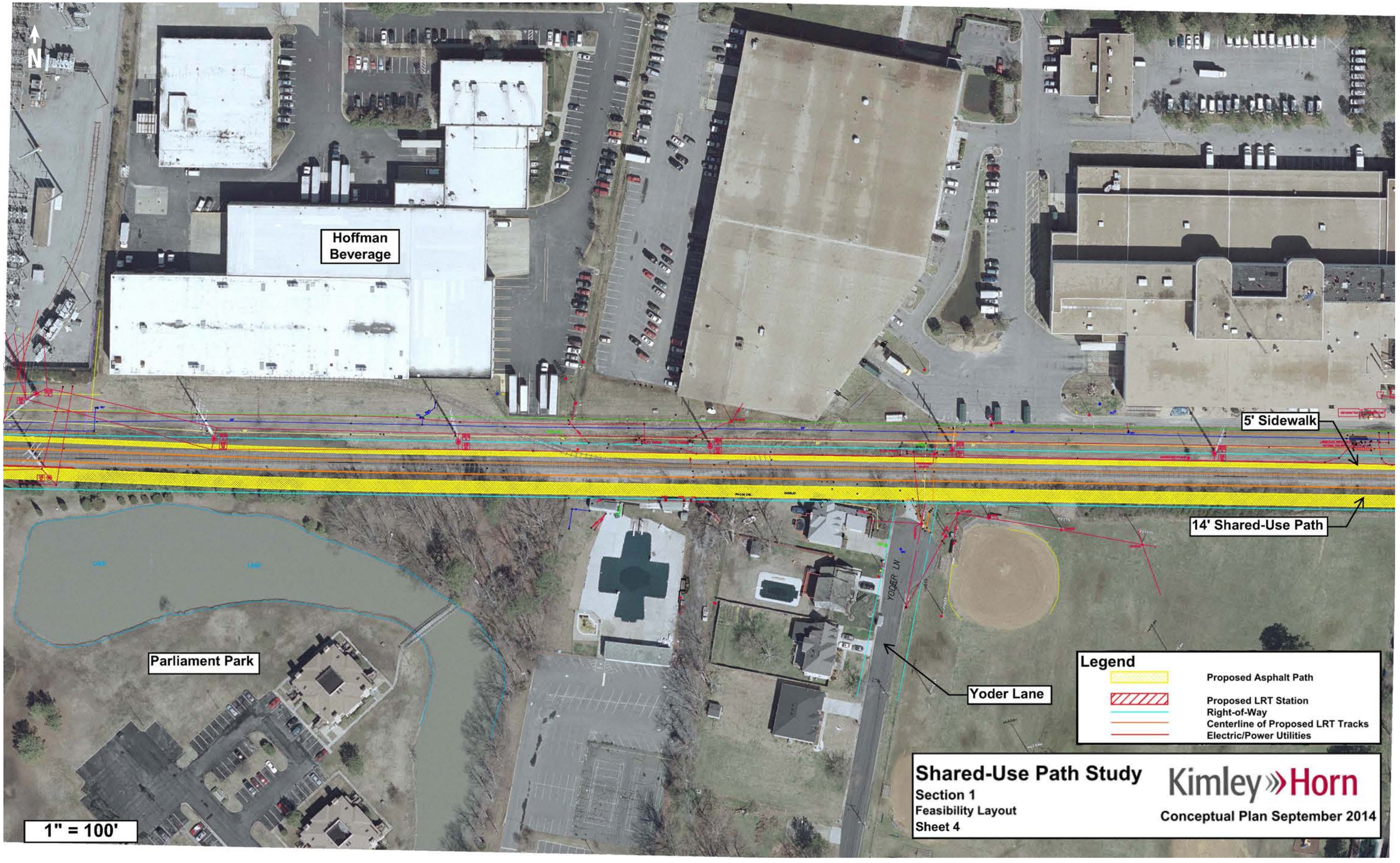
N
Hoffman Beverage
5' Sidewalk
14' Shared-Use Path
Parliament Park
YODER LN
Yoder Lane
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 4
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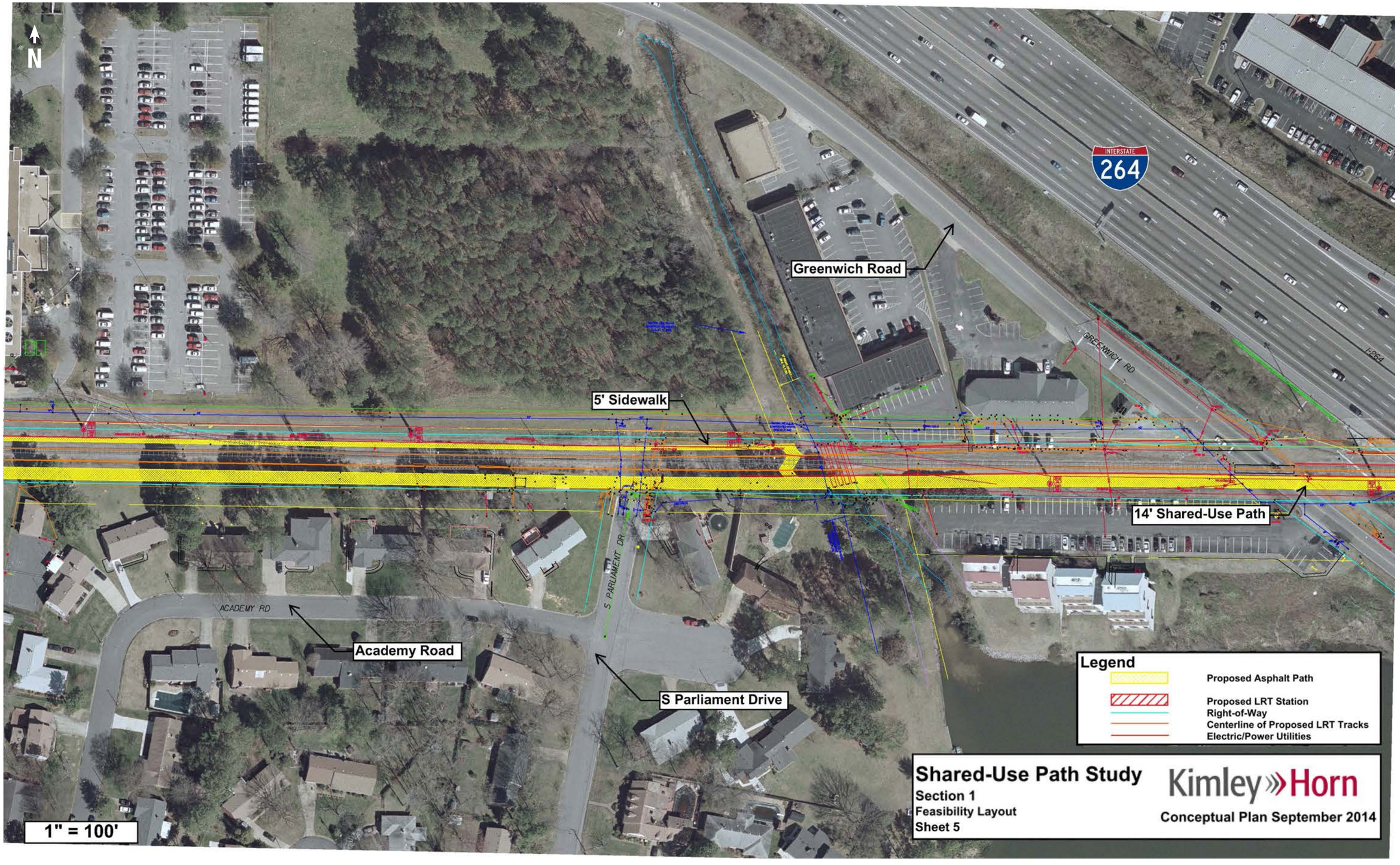
N
INTERSTATE
264
I-264
GREENWICH RD
Greenwich Road
5' Sidewalk
14' Shared-Use Path
ACADEMY RD
Academy Road
S PARLIAMENT DR
S Parliament Drive
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 5
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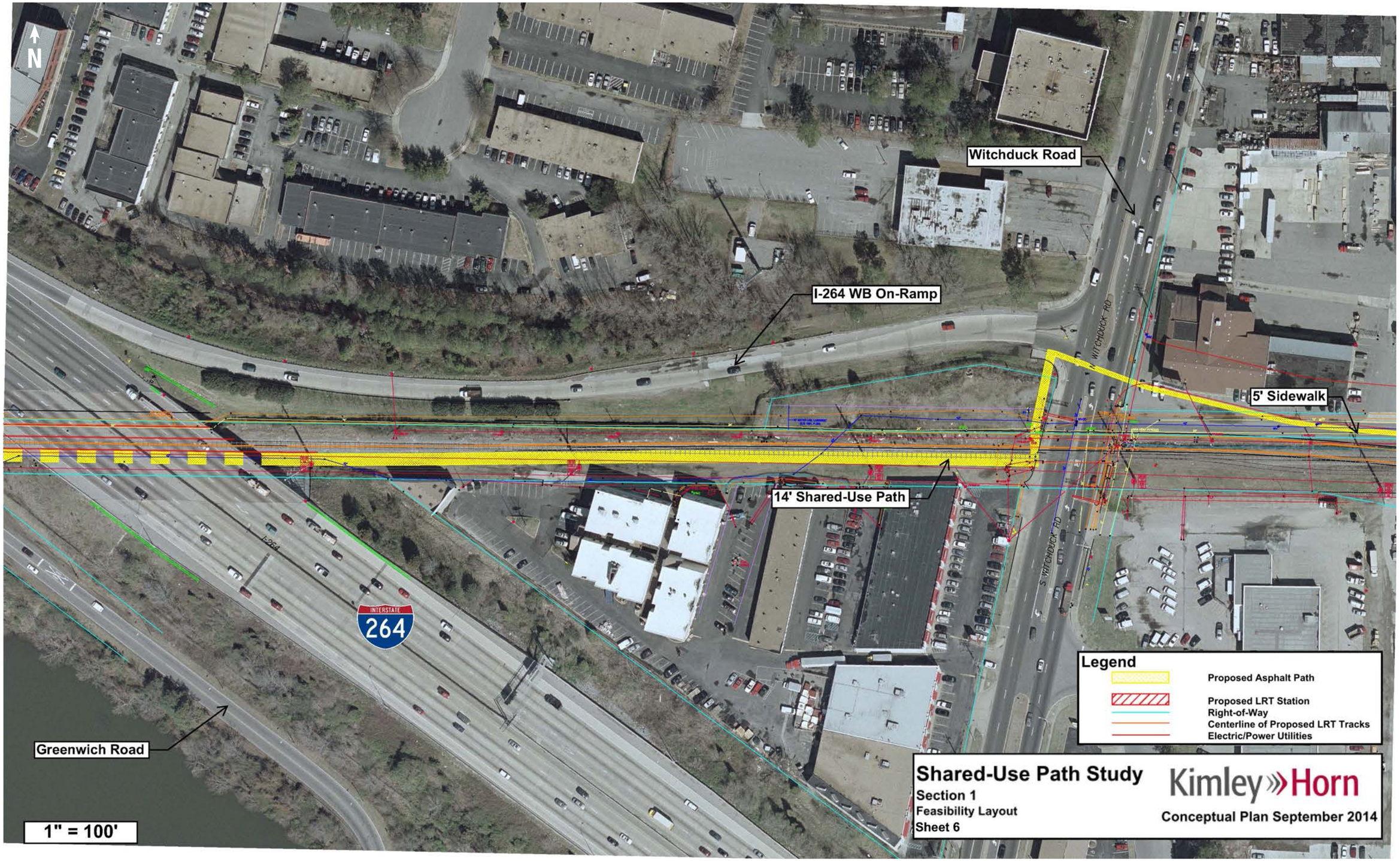
N
Witchduck Road
I-264 WB On-Ramp
WITCHDUCK RD
5' Sidewalk
14' Shared-Use Path
S WITCHDUCK RD
I-264
INTERSTATE
264
Greenwich Road
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 6
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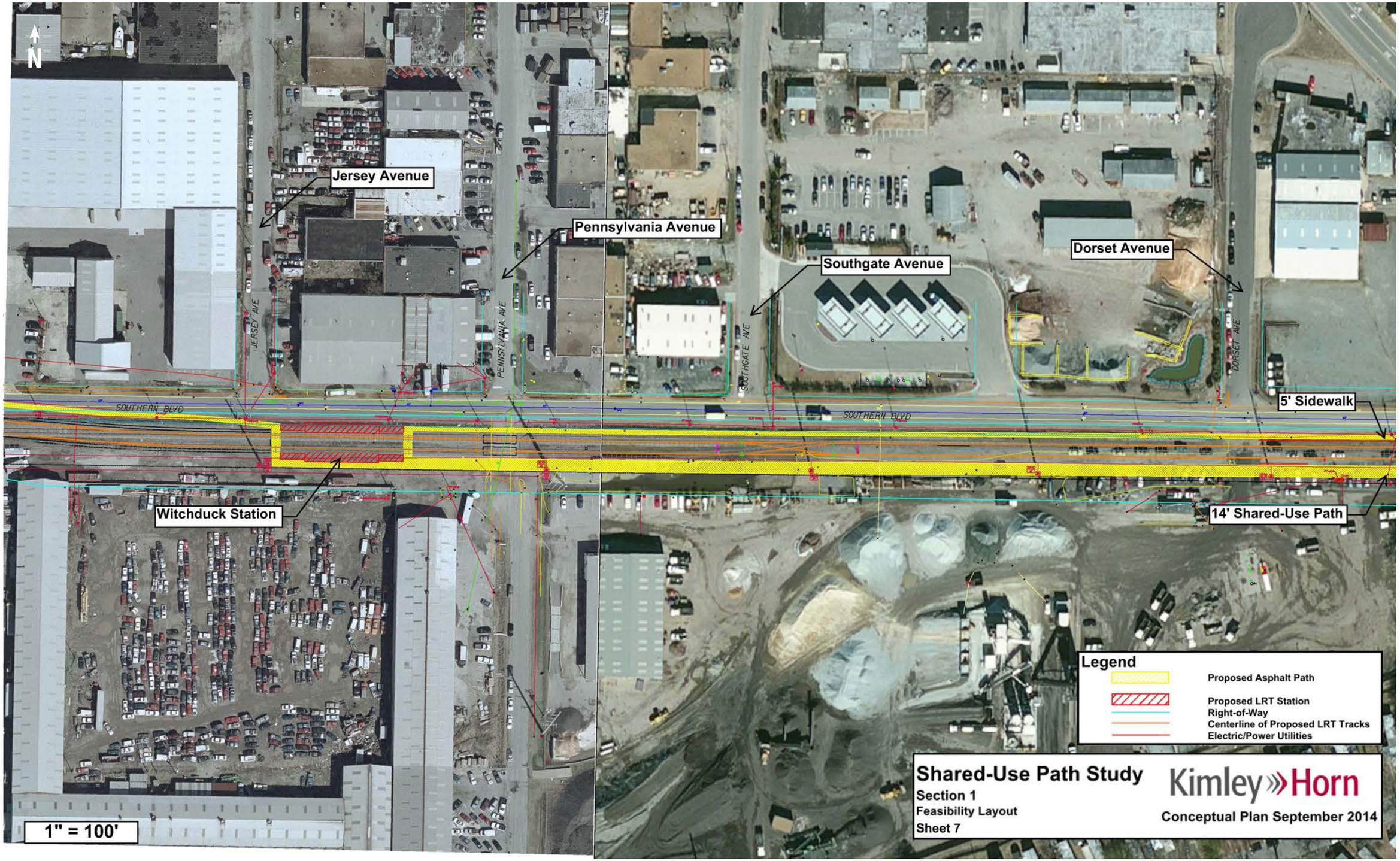
N
Jersey Avenue
Pennsylvania Avenue
Southgate Avenue
Dorset Avenue
5' Sidewalk
14' Shared-Use Path
Witchduck Station
JERSEY AVE
PENNSYLVANIA AVE
SOUTHGATE AVE
DORSET AVE
SOUTHERN BLVD
SOUTHERN BLVD
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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N
Opal Avenue
EUCLID RD
OPAL AVE
SOUTHERN BLVD
5' Sidewalk
14' Shared-Use Path
HOLLAND DR
EUCLID RD
Euclid Road
Holland Drive
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
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Section 1
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Sheet 8
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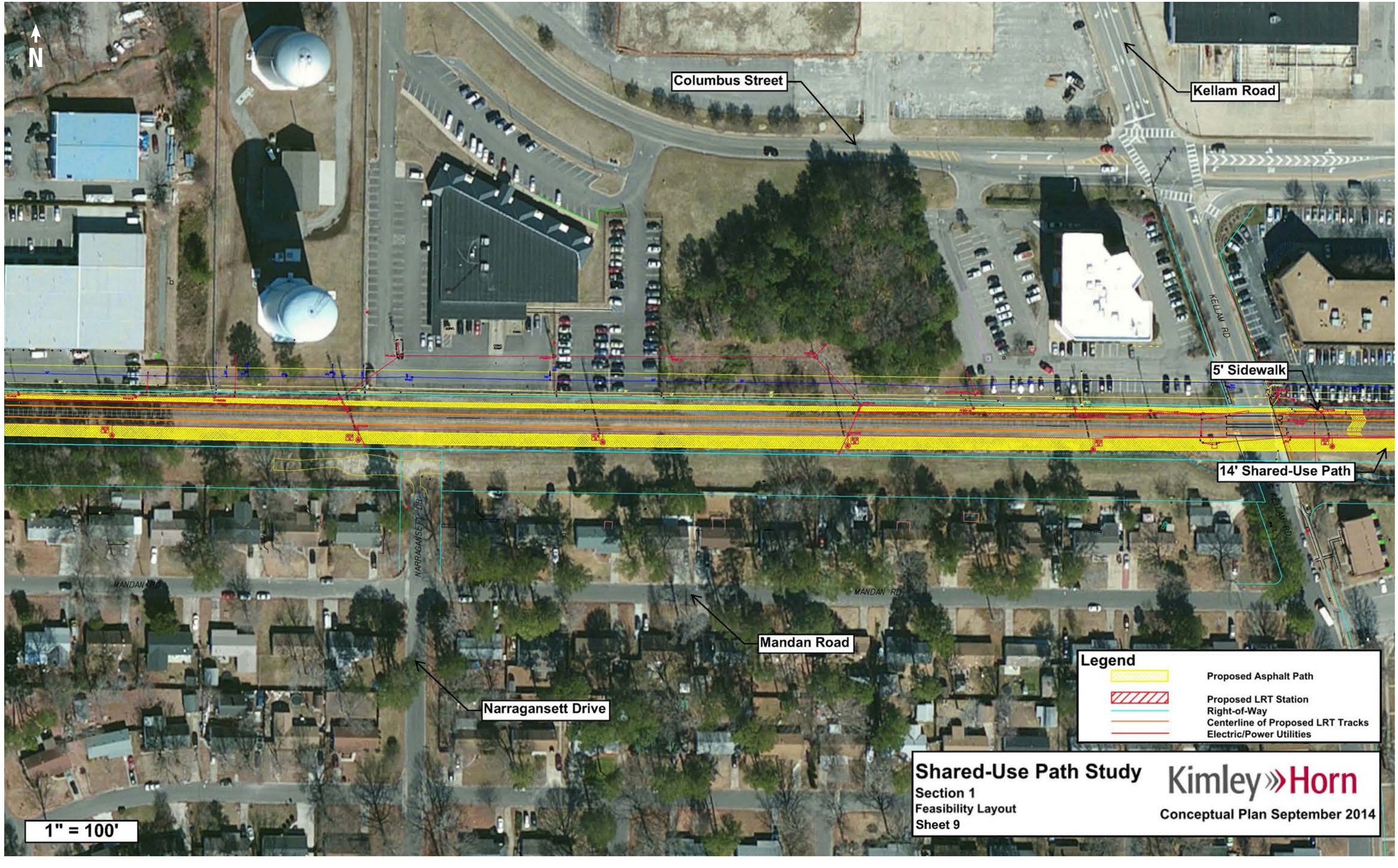
N
Columbus Street
Kellam Road
KELLAM RD
5' Sidewalk
14' Shared-Use Path
NARRAGANSETT DR
MANDAN RD
MANDAN RD
Mandan Road
Narragansett Drive
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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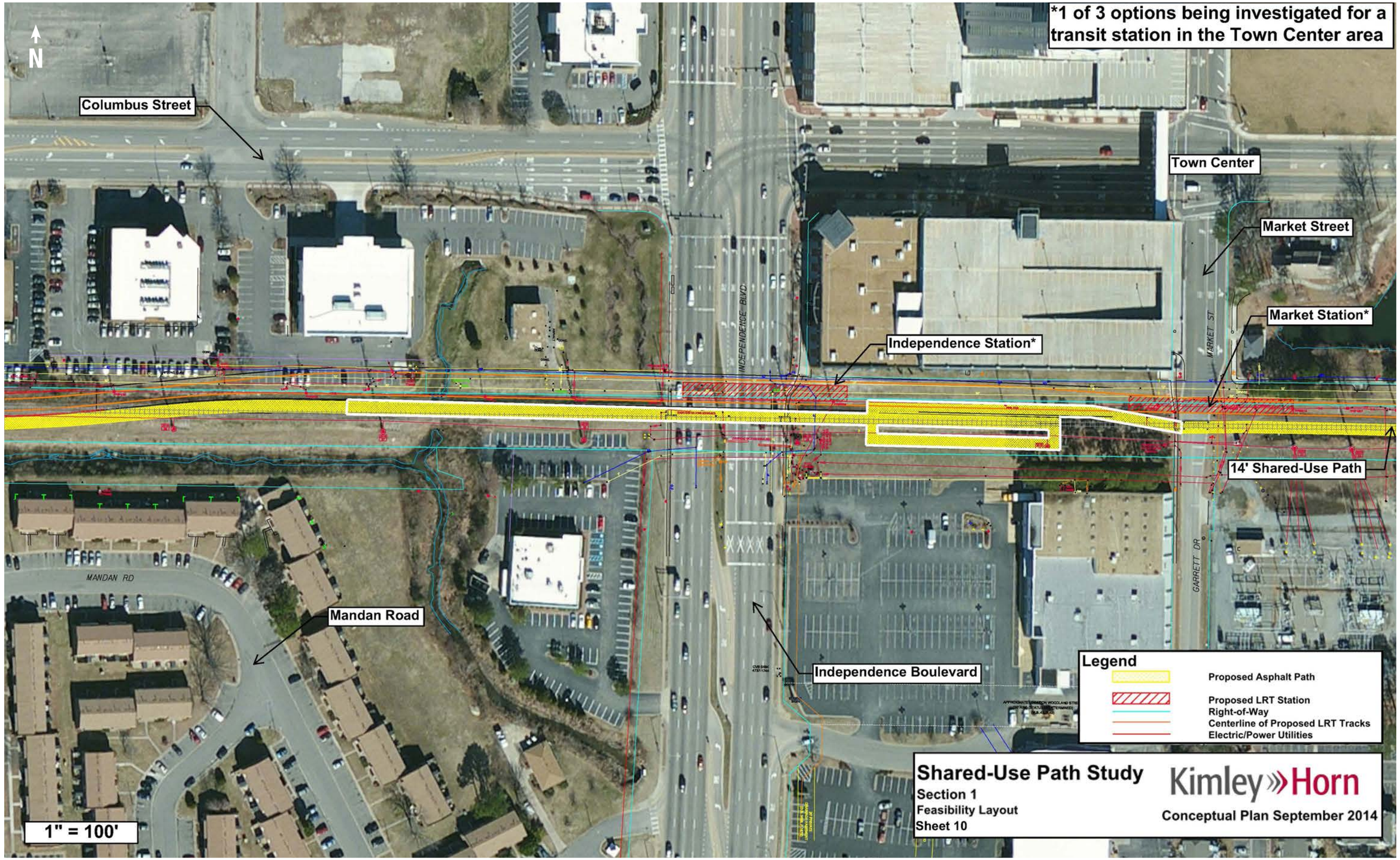
*1 of 3 options being investigated for a transit station in the Town Center area
N
Columbus Street
Town Center
Market Street
Market Station*
Independence Station*
INDEPENDENCE BLVD
MARKET ST
14' Shared-Use Path
GARRETT DR
MANDAN RD
Mandan Road
Independence Boulevard
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 1
Feasibility Layout
Sheet 10
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Conceptual Plan September 2014
1" = 100'

Town Center to London Bridge Road

From Town Center to London Bridge Road, the former NSRR right-of-way runs a straight, east/west path. The corridor consists mostly of residential and commercial development, with some industrial development also included. See Sheets 11 through 25 for a detailed layout of this area.

Strategic Growth Areas

The Pembroke SGA, described in the previous section, encompasses the initial section of this corridor – from Town Center to the western bank of Thalia Creek. The next SGA that the project corridor passes through is the Rosemont SGA, beginning just north of Majestic Circle and extending east to Groveland Road. The vision for the Rosemont SGA has been defined by the plan as a mixed-use development with a neighborhood center, improved pedestrian and trail facilities, and a street block structure created to accommodate development and mobility. The key recommendations developed include designing a "transit ready" framework that permits adequate scale and density. The shared-use path aligns with these needs as it will offer a trail facility to improve pedestrian mobility; it also is accommodating of a transit line.

Starting at Groveland Road and reaching east to London Bridge Road is the Lynnhaven SGA. According to the Plan's vision, the Lynnhaven SGA will be a series of mixed-use and flexible developments along with targeted public infrastructure improvements. The commercial properties will have the opportunity to take advantage of potential transit. At the center of the redevelopment may be a new transit station that can provide park-and-ride connection to nearby attractions. The plan to develop this area includes connecting future transit to employment, recreational destinations, and a park-and-ride, as well as improving multi-modal connections from the adjacent neighborhoods. The implementation of a shared-use path would help to link these areas and add to multi-modal connections for bicycle and pedestrian traffic.

Street Crossings

Immediately east of the Constitution Drive crossing, the 5-foot sidewalk on the north side of the corridor begins again. Both the 5-foot sidewalk and 14-foot path continue to the next major crossing – a water crossing at Thalia Creek. For the path to continue over Thalia Creek, a structure will be required. It is recommended that this structure be parallel to, but separate from, the proposed LRT structure. By separating these two structures, the lesser load requirements can be used for the shared-use path structure. It is also recommended that the structure be built to accommodate a 14-foot path on either side of the LRT; this will allow for future expansion of the 5-foot path without having to modify the structure crossing Thalia Creek. At this location, it is important to consider the Thalia Creek Greenway Plans to ensure a connection between the two facilities is coordinated.

There are several existing at-grade street crossings between Thalia Creek and Kentucky Avenue. These streets are residential in nature and carry a low volume of vehicular traffic. These streets include South Fir Avenue, South Thalia Road, and South Budding Avenue. South Fir Avenue and South Budding Avenue are planned to be closed with the HRT LRT project, leaving South Thalia Road as the only crossing in this vicinity. The at-grade crossing with South Thalia Road will consist of a stop sign-controlled shared-use path and sidewalk.

Kentucky Avenue is the next major street that the proposed path alignment crosses. Kentucky Avenue is a two-lane facility with signalized intersections at Bonney Road and Virginia Beach Boulevard; however, the shared-use path crosses Kentucky Avenue in-between these two intersections. Therefore, a mid-block crossing is recommended with the shared-use path and sidewalk having stop signs to control the flow across Kentucky Avenue.

The next major road that the path alignment nears is Lynn Shores Drive South. The former NSRR right-of-way is approximately 50 feet south of the existing signal for Lynn Shores Drive and Virginia Beach Boulevard. To stop traffic mid-block for pedestrians and bicyclists within this distance is not advised per the MUTCD. Along the parallel section of Virginia Beach Boulevard, there is an existing sidewalk. The proposed 5-foot sidewalk alignment takes advantage of this existing facility, and connects to the existing Virginia Beach Boulevard sidewalk west of the Lynn Shores Drive intersection. This sidewalk is linked to the controlled intersection at Lynn Shores Drive South and Virginia Beach Boulevard, providing a safe crossing for pedestrians. The 14-foot shared-use path continues south of the tracks and crosses Lynn Shores Drive. The 14-foot path will be stop sign-controlled. There is also a gated crossing proposed with the LRT plans that will give users of the shared-use path an opportunity to cross Lynn Shores Drive with the trains.

To the east of Lynn Shores Drive South is the Rosemont transit station. Each transit station allows for connectivity between the northern and southern sides of the tracks. Here, bicycles and pedestrians traveling on the existing sidewalk have the option to transfer to the 14-foot path on the south side of the LRT tracks. The 14-foot path continues along the south side of the LRT track alignment, and next reaches North Rosemont Road. Due to the high traffic volume on this six-lane facility, the path will cross Rosemont Road as an elevated structure. This structure will be separate from the LRT elevated structure over Rosemont Road; both will require a 16.5-foot clearance over the roadway. It is recommended that the pedestrian structure be designed with 3.5% slopes.

While there is an existing traffic signal at the Rosemont Road/Bonney Road/I-264 Off-Ramp intersection, there are extremely high volumes of vehicles making turns which pose safety concerns for crossing pedestrians and bicyclists at-grade.

Between Rosemont Road and Plaza Trail, the alignment of the path makes a gradual shift south. This allows enough right-of-way to incorporate a Z-crossing and again include both a 5-foot sidewalk on the north side of the tracks. At the location immediately following the proposed Z-crossing, the existing right-of-way limits shift. There is a parcel on the south side of the proposed LRT tracks, GPIN 14876490460000, which is state property. In order to work around this limited right-of-way, approximately 400 feet of the corridor in this location will only be able to accommodate a 5-foot sidewalk. In order to avoid discontinuity of the shared-use path, right-of-way acquisition is necessary. This dual pathway layout continues until Plaza Trail. At Plaza Trail, a mid-block crossing is recommended to cross the four-lane facility. If design of the path is advanced, sight distances at this location need to be considered in light of its proximity to the fill and crossing of I-264 over Plaza Trail.

The next intersection is at Lynnhaven Road. A mid-block crossing is recommended to allow bicycles and pedestrians to safely cross the two-lane roadway with the path and sidewalk being stop sign-controlled.

Lynnhaven Parkway is the next major intersection where the rail is grade-separated from the roadway. At this location, the 5-foot sidewalk and 14-foot path are both present. The 5-foot sidewalk will continue as an at-grade crossing. The existing stop sign controlled intersection at Southern Boulevard and Lynnhaven Parkway can be used by traffic on the 5-foot sidewalk. The 14-foot path will be elevated. Similar to previously proposed elevated pedestrian structures, the structure will be separate from that of the LRT. It will be a stand-alone structure, will have a 16.5-foot clearance, and is recommended to be designed with 3.5% grades. This will allow a safe crossing without interrupting traffic on Lynnhaven Parkway.

As the proposed path approaches Lynnhaven River, a water crossing will be required. Similar to the Thalia Creek crossing, it is recommended that the structure be built to accommodate a 14-foot path on either side of the LRT to allow for future expansion.

The next major intersection is at London Bridge Road. At this location, there is an existing traffic signal. This signal will be utilized as an opportunity to safely cross bicycle and pedestrian traffic at-grade.

Transit Stops

The first transit stop east of the Town Center station is the Rosemont Station at Lynn Shores Drive. East of the Rosemont Station is the Lynnhaven Station, which is located west of Lynnhaven Road. Near each station are proposed park-and-ride facilities.

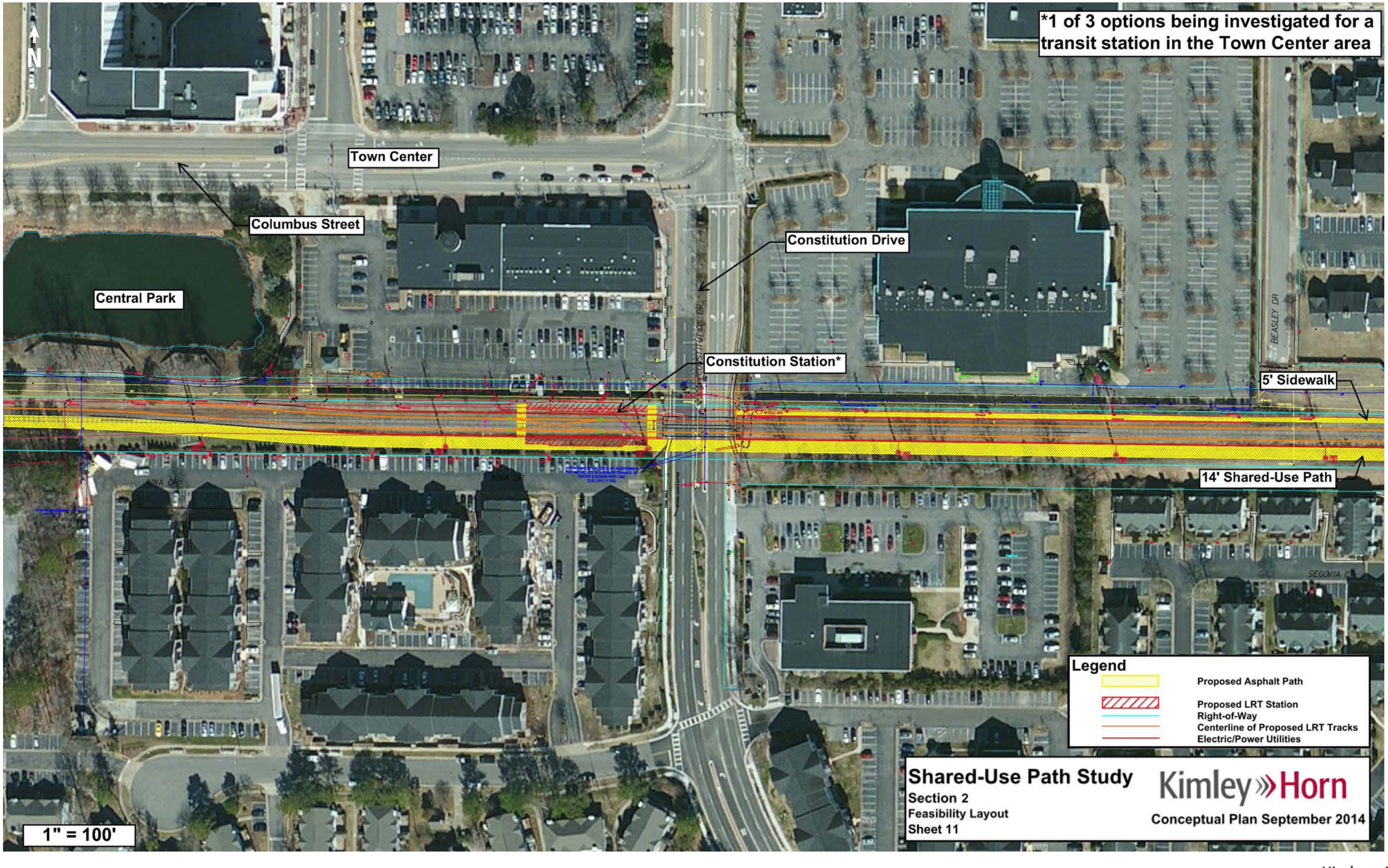
Drainage

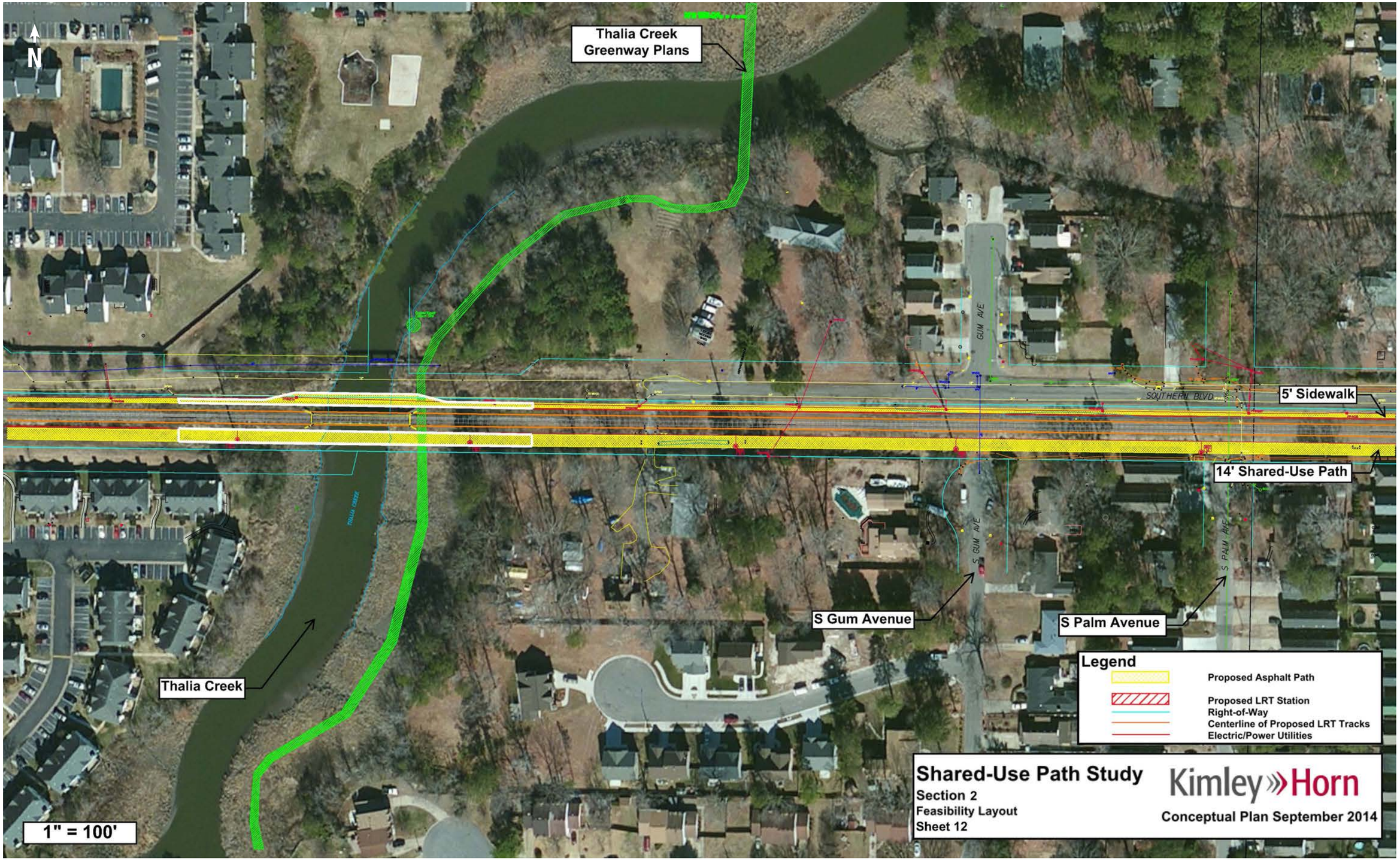
From Town Center to London Bridge Road, the majority of the existing corridor uses an open ditch drainage system. Generally, there are 8 feet or more of separation between the proposed edge of the path and the right-of-way line. Similar to the section from Newtown Road to the Oceanfront, the proposed path will pave over the existing ditch, requiring drainage improvements to be made.

Potential main outfalls were identified between Town Center and London Bridge Road to be Thalia Creek, Pinetree Branch, and Lynnhaven River. If stormwater runoff quality measures are not met through wet or dry swales, a parcel on the east bank of Thalia Creek would need to be identified for placement of a BMP. This would require right-of-way acquisition by the City, as the City does not currently own land in this area. On the southwest side of Pinetree Branch, a parcel could be designated for BMP use if needed. Currently, the City owns parcels in this area, GPIN 14879395400000 and GPIN 14971352550000. If use of either was approved, right-of-way acquisition would not be necessary. The East Branch of the Lynnhaven River was identified as the easternmost outfall along the corridor from Town Center to London Bridge Road. If BMP land area is needed, it would be desirable for the City to permit a parcel on each side of the river; the City already owns a parcel on the southwest side, GPIN 14976370120000. If this parcel could be used, right-of-way would only be needed on the eastern side of the East Branch of the Lynnhaven River.

Preliminary Opinion of Probable Cost

This 4.7 mile section of the project is estimated to cost approximately $29.3 million based on conceptual level planning. This price estimate includes two elevated structures and two water crossings totaling about $18.1 million. On a price per mile basis, this section of the project is about $6.9 million per mile. This cost per mile is the highest of the sections, but also includes the most structural elements.


*1 of 3 options being investigated for a transit station in the Town Center area
N
Town Center
Columbus Street
Central Park
Constitution Drive
Constitution Station*
5' Sidewalk
14' Shared-Use Path
CONSTITUTION DR
BEASLEY DR
NINA DR
NINA DR
SEGOVIA CT
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 11
Kimley»Horn
Conceptual Plan September 2014
1" = 100'


N
Thalia Creek Greenway Plans
GUM AVE
SOUTHERN BLVD
5' Sidewalk
14' Shared-Use Path
S GUM AVE
S PALM AVE
S Gum Avenue
S Palm Avenue
Thalia Creek
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
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Sheet 12
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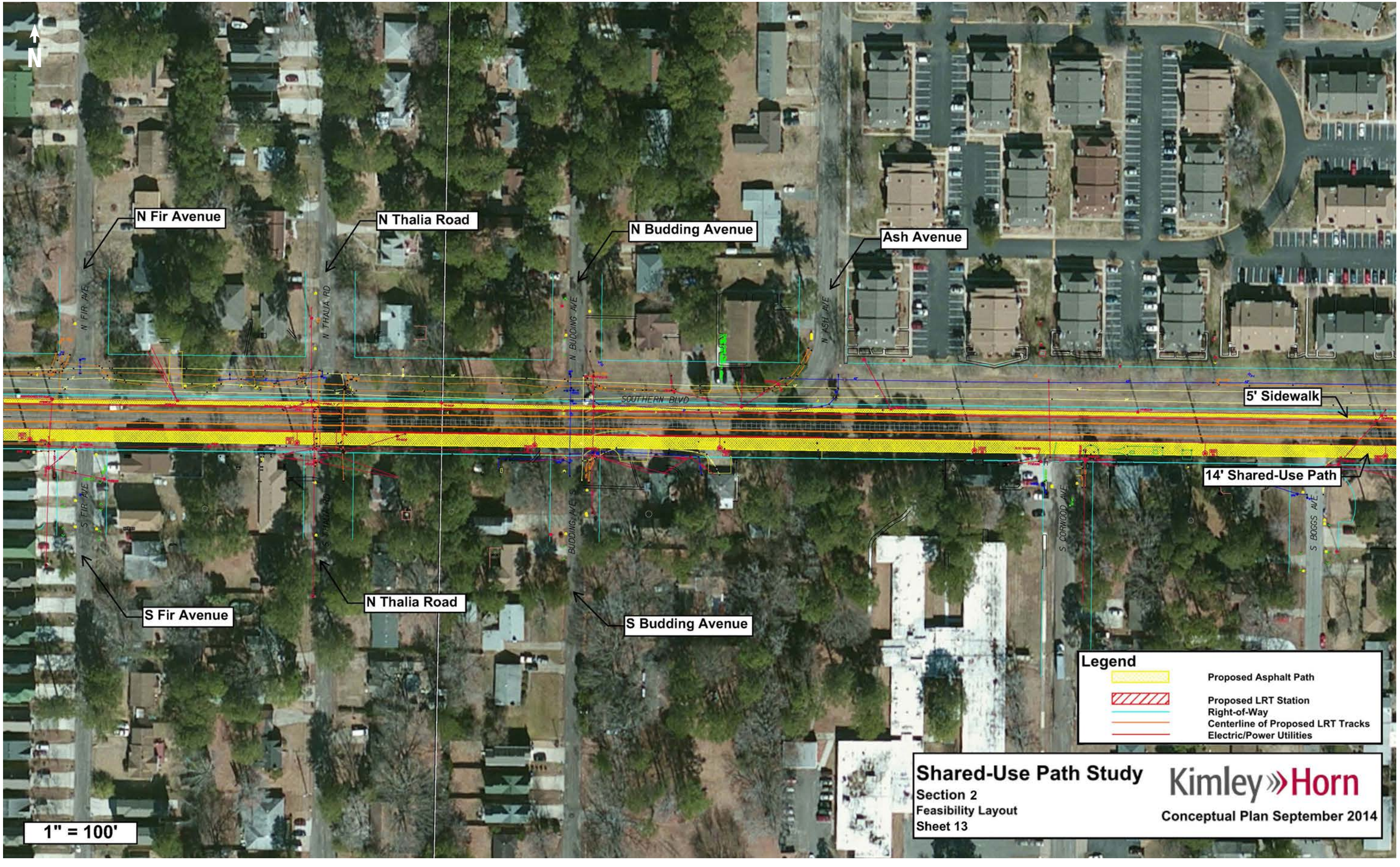
N
N Fir Avenue
N Thalia Road
N Budding Avenue
Ash Avenue
N FIR AVE
N THALIA RD
N BUDDING AVE
N ASH AVE
SOUTHERN BLVD
5' Sidewalk
14' Shared-Use Path
S FIR AVE
S THALIA RD
BUDDING AVE S
S CORWOOD AVE
S BOGGS AVE
S Fir Avenue
N Thalia Road
S Budding Avenue
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 13
Kimley»Horn
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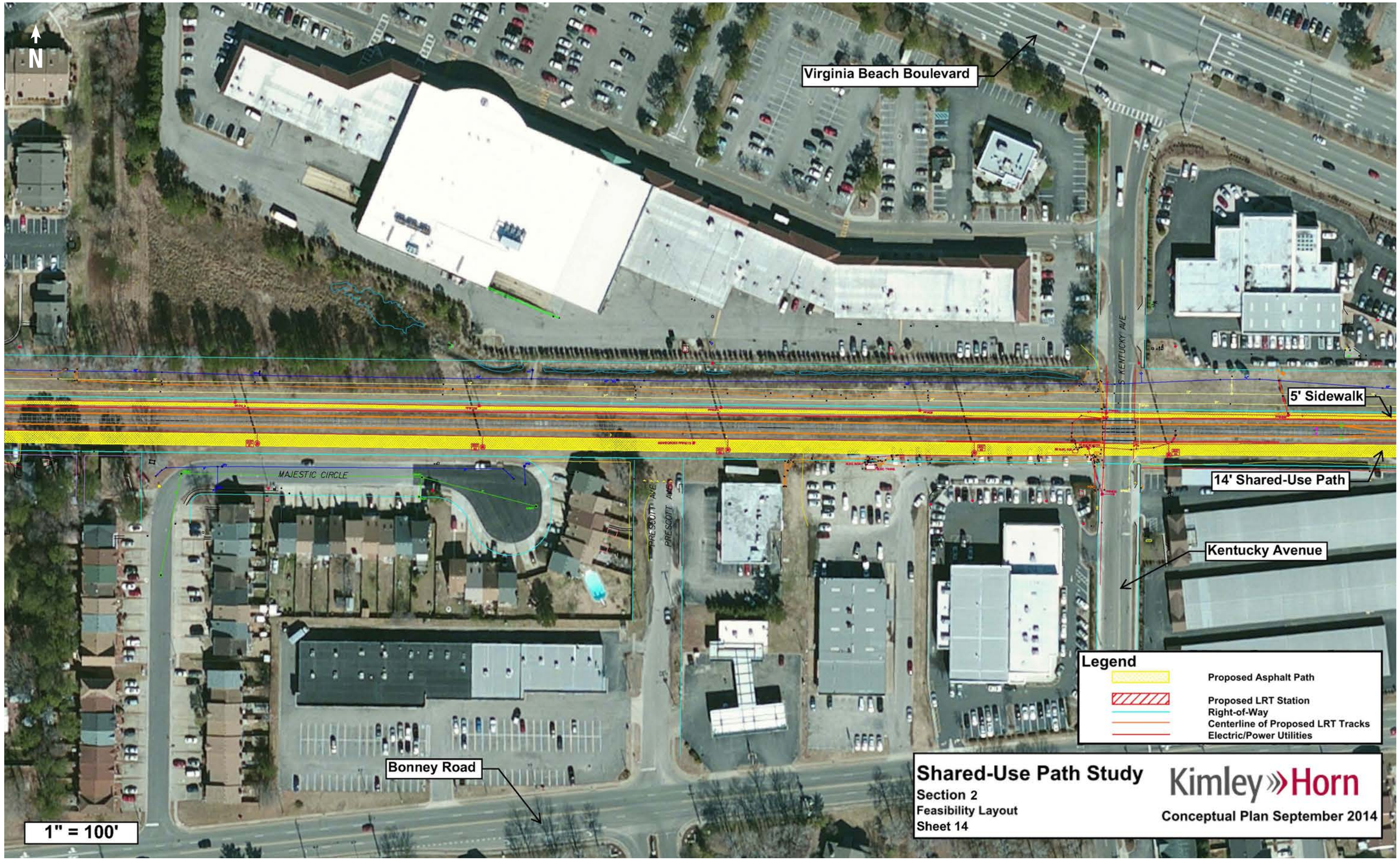
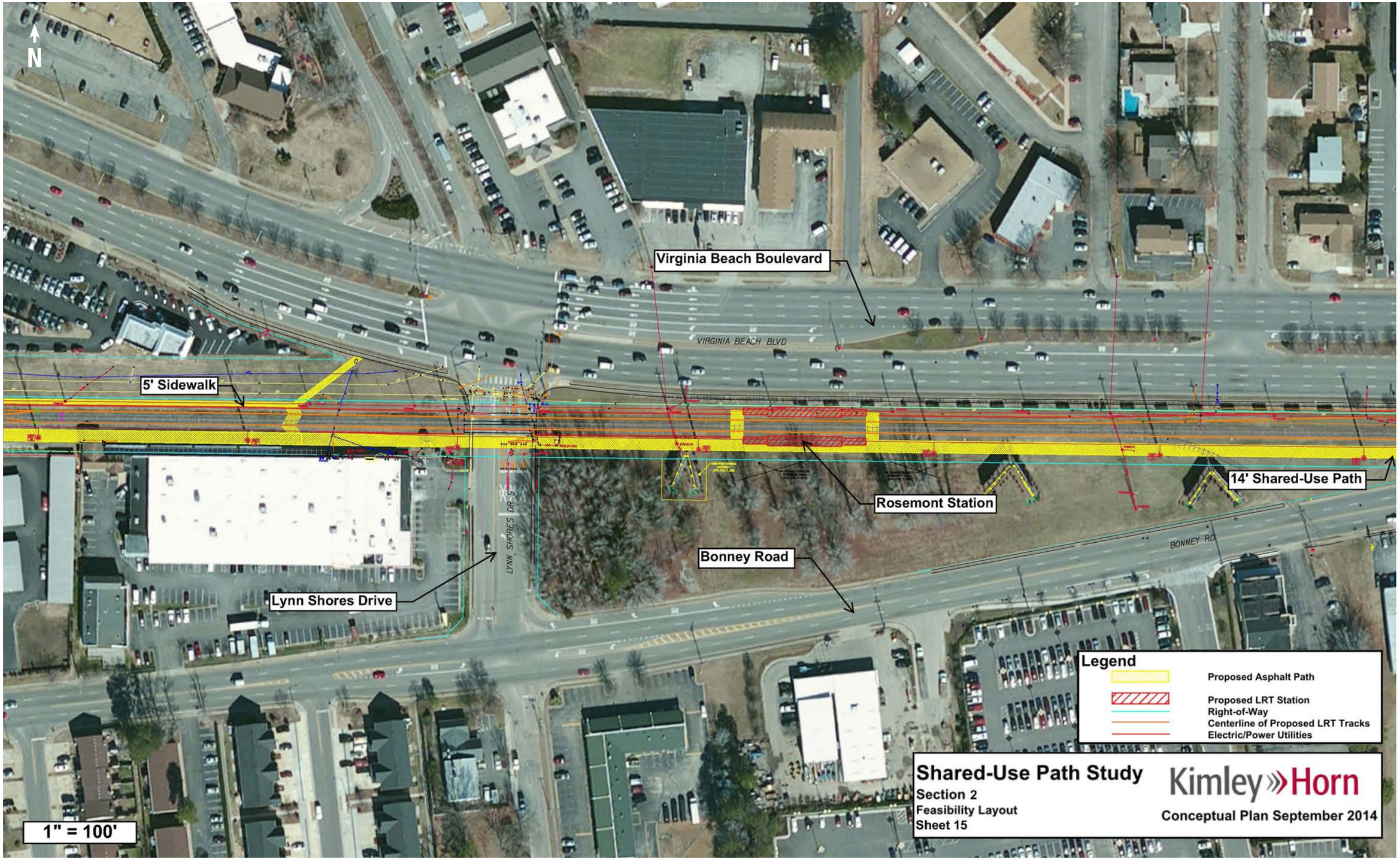
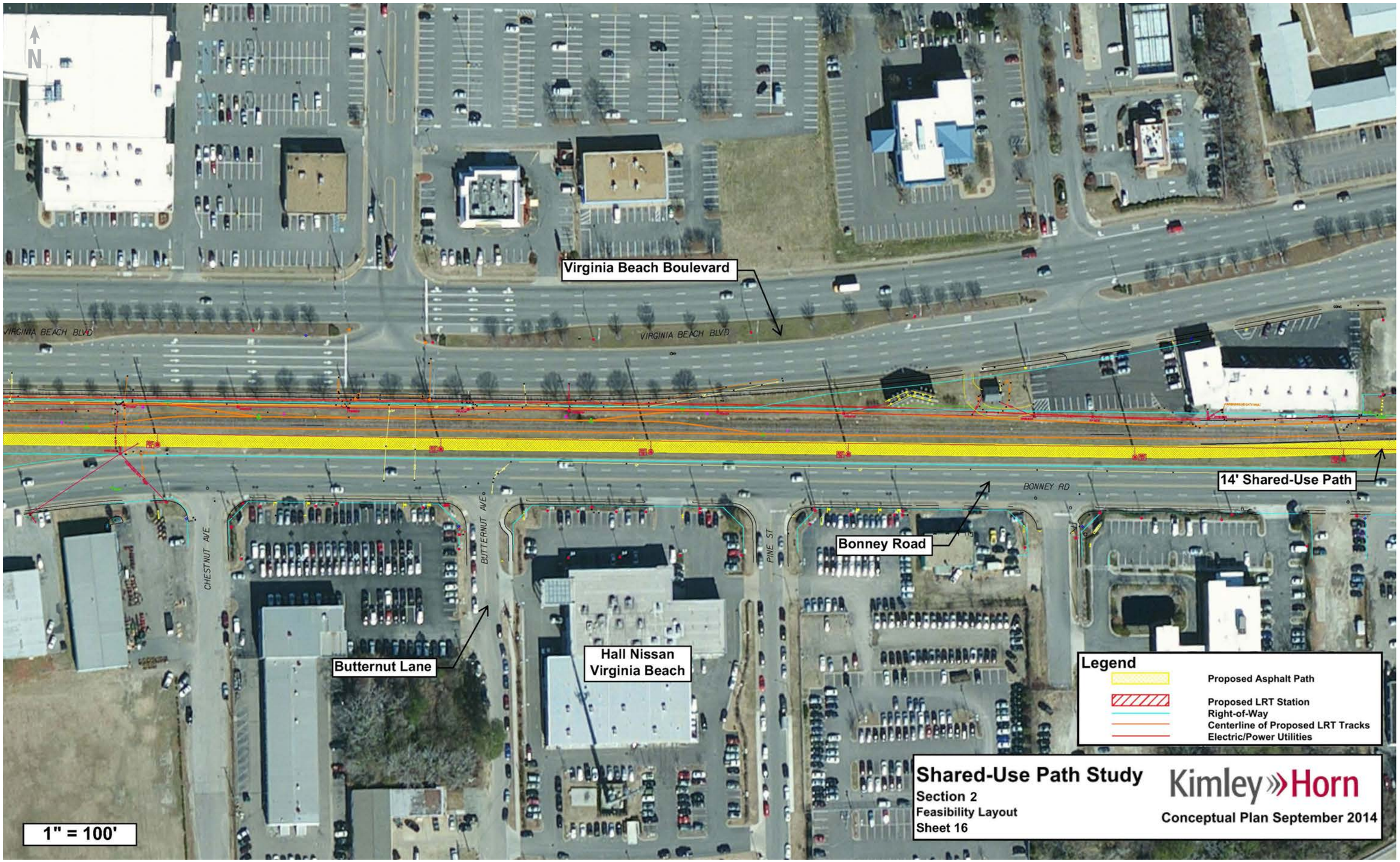
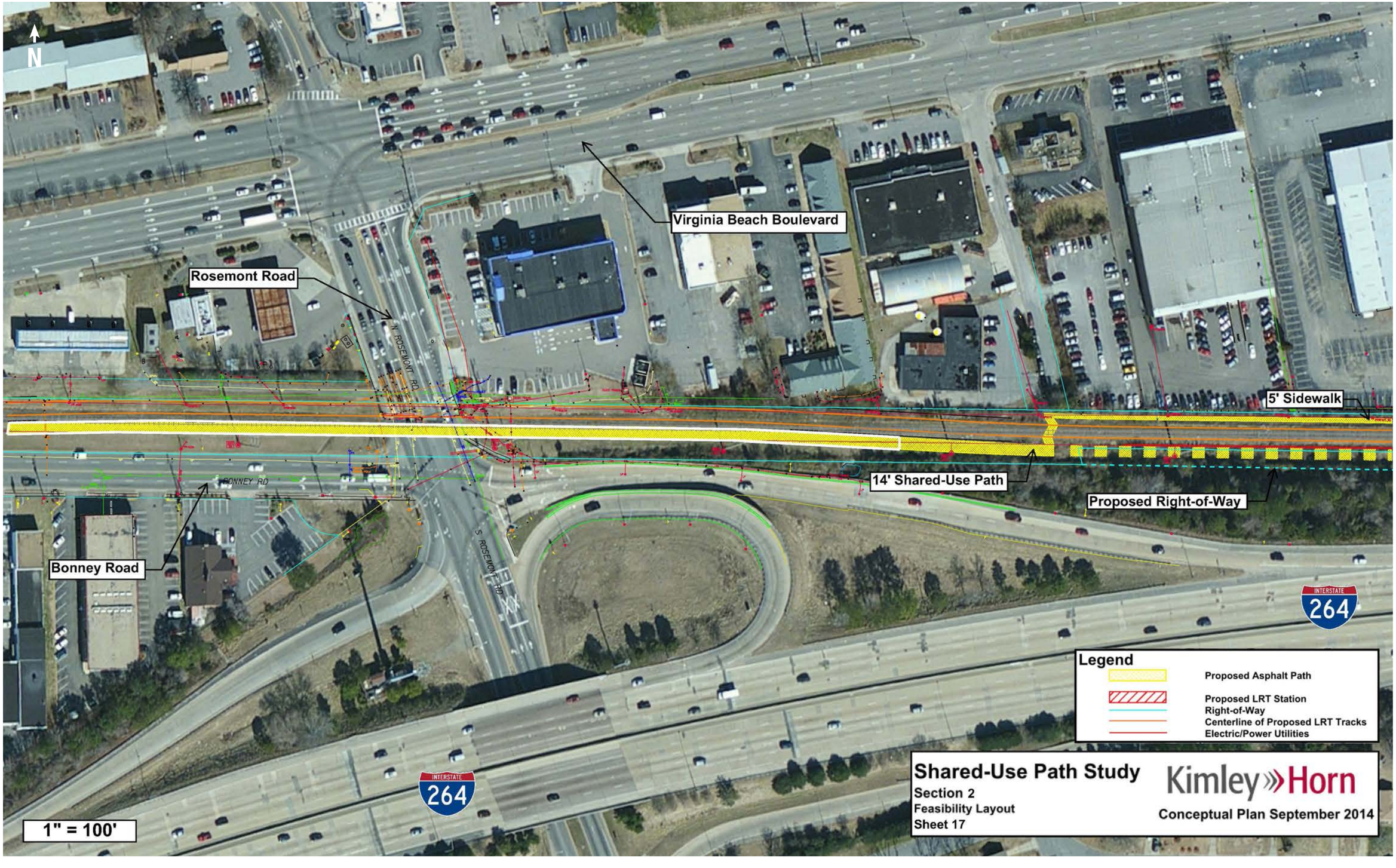
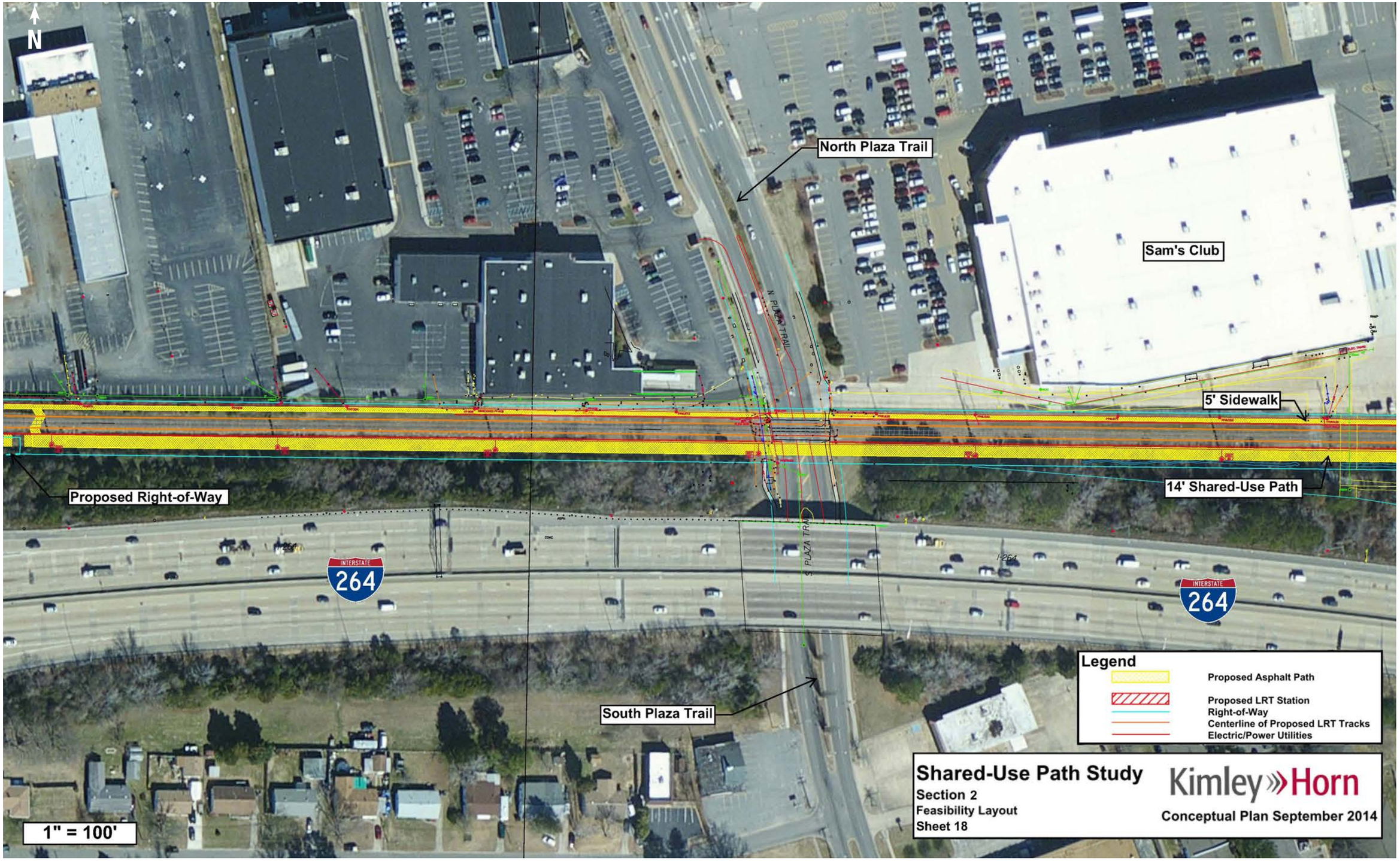

N
Virginia Beach Boulevard
S. KENTUCKY AVE
5' Sidewalk
MAJESTIC CIRCLE
PRESCOTT AVE
PRESCOTT AVE
14' Shared-Use Path
Kentucky Avenue
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Bonney Road
1" = 100'
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 14
Kimley»Horn
Conceptual Plan September 2014


N
Virginia Beach Boulevard
VIRGINIA BEACH BLVD
5' Sidewalk
Rosemont Station
14' Shared-Use Path
LYNN SHORES DR
BONNEY RD
Bonney Road
Lynn Shores Drive
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 15
Kimley»Horn
Conceptual Plan September 2014
1" = 100'


N
Virginia Beach Boulevard
VIRGINIA BEACH BLVD
VIRGINIA BEACH BLVD
CHESTNUT AVE
BUTTERNUT AVE
PINE ST
BONNEY RD
Bonney Road
14' Shared-Use Path
Butternut Lane
Hall Nissan
Virginia Beach
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 16
Kimley»Horn
Conceptual Plan September 2014


N
Rosemont Road
Virginia Beach Boulevard
5' Sidewalk
14' Shared-Use Path
Proposed Right-of-Way
Bonney Road
N ROSEMONT RD
BONNEY RD
S ROSEMONT RD
INTERSTATE 264
INTERSTATE 264
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 17
Kimley»Horn
Conceptual Plan September 2014


N
North Plaza Trail
Sam's Club
5' Sidewalk
Proposed Right-of-Way
14' Shared-Use Path
INTERSTATE 264
South Plaza Trail
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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N
Groveland Road
Rosegate Court
Warren Place
Rosegate Place
ROSEGATE PL
WARREN PL
5' Sidewalk
14' Shared-Use Path
INTERSTATE
264
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
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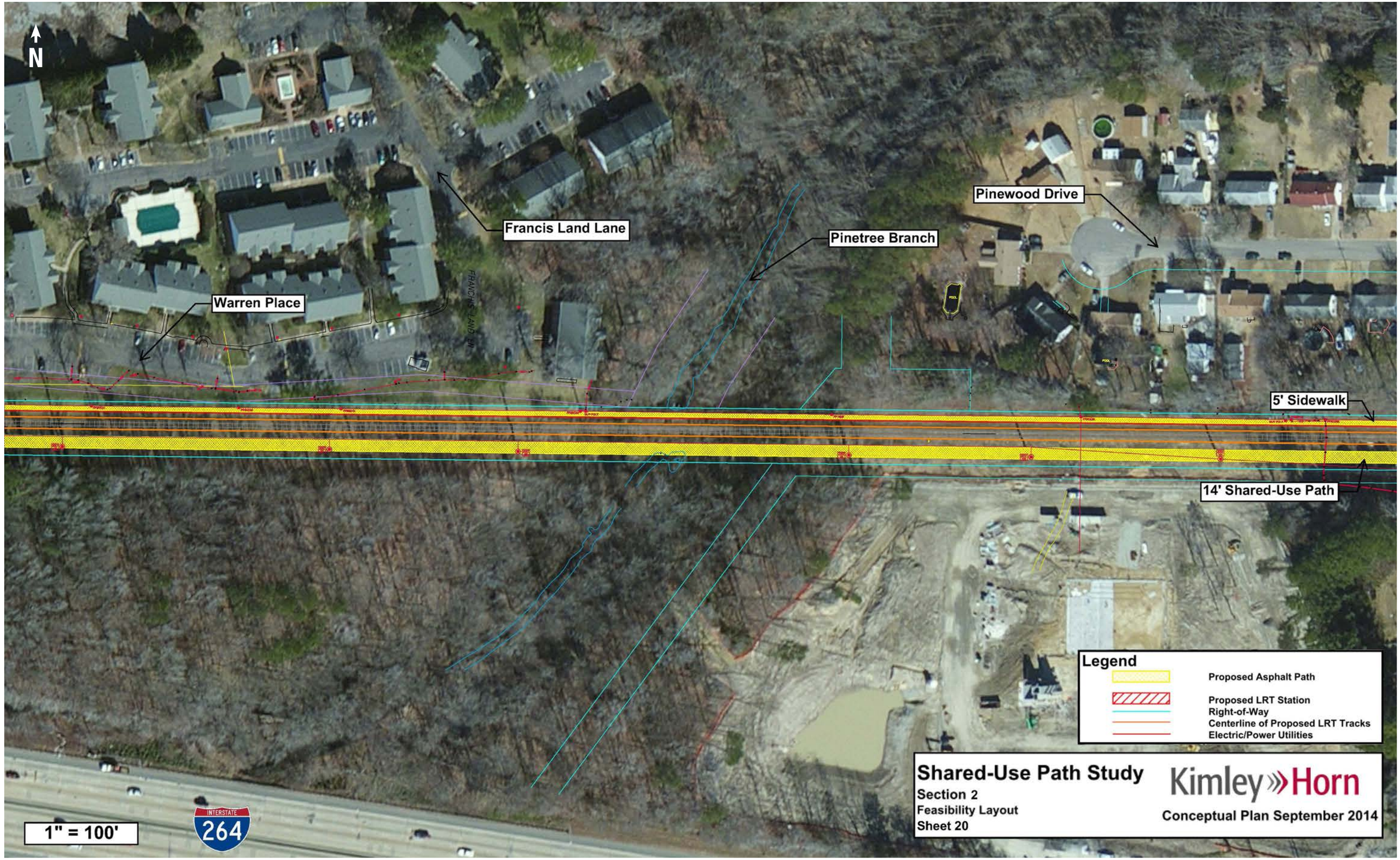
N
Francis Land Lane
Pinetree Branch
Pinewood Drive
Warren Place
5' Sidewalk
14' Shared-Use Path
FRANCIS LAND LN
POOL
POOL
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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Sheet 20
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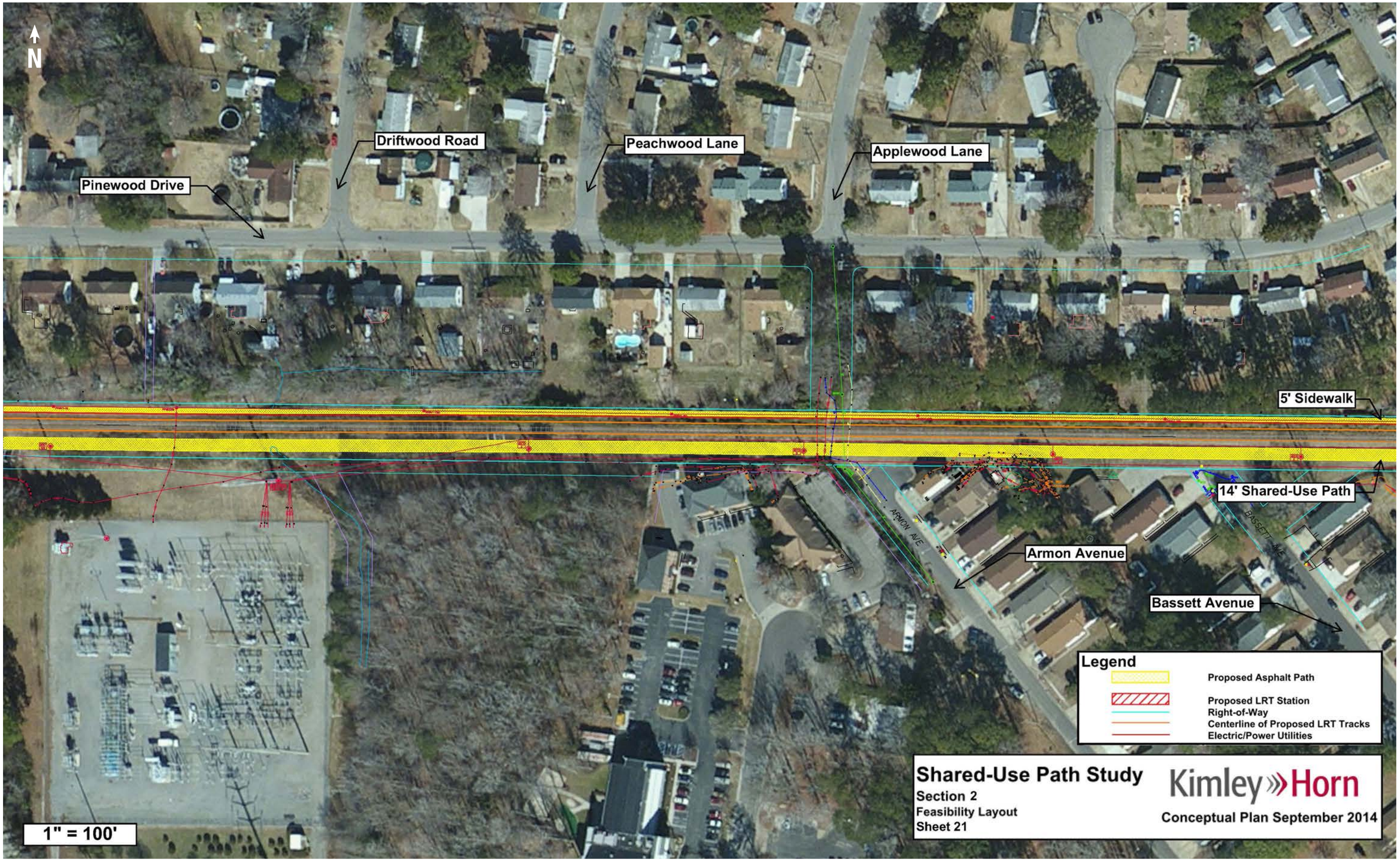
1" = 100'
INTERSTATE
264


N
Pinewood Drive
Driftwood Road
Peachwood Lane
Applewood Lane
5' Sidewalk
14' Shared-Use Path
Armon Avenue
Bassett Avenue
ARMON AVE
BASSETT AVE
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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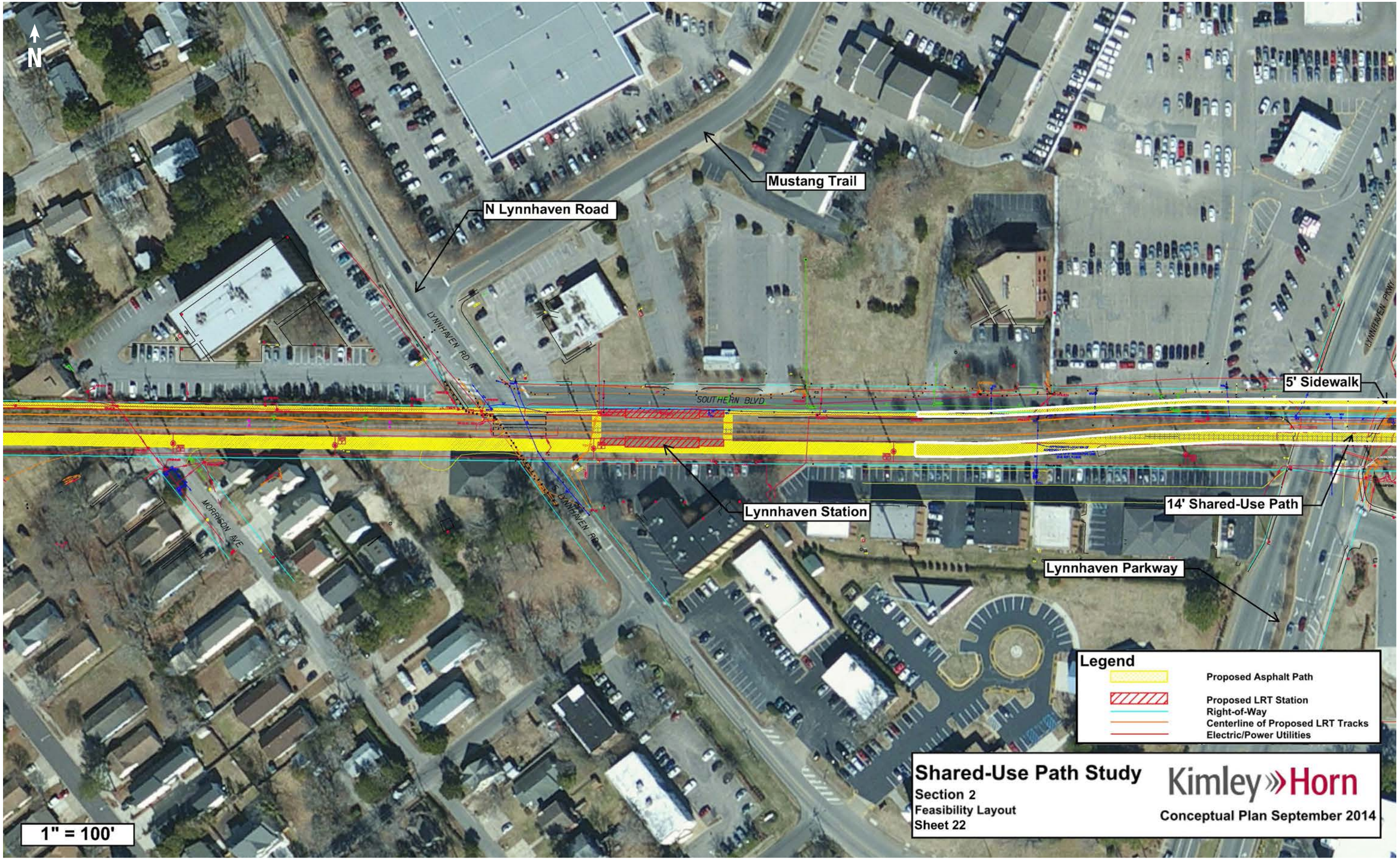
N
Mustang Trail
N Lynnhaven Road
LYNNHAVEN RD
SOUTHERN BLVD
LYNNHAVEN PKWY
5' Sidewalk
MORRISON AVE
S LYNNHAVEN RD
Lynnhaven Station
14' Shared-Use Path
Lynnhaven Parkway
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 2
Feasibility Layout
Sheet 22
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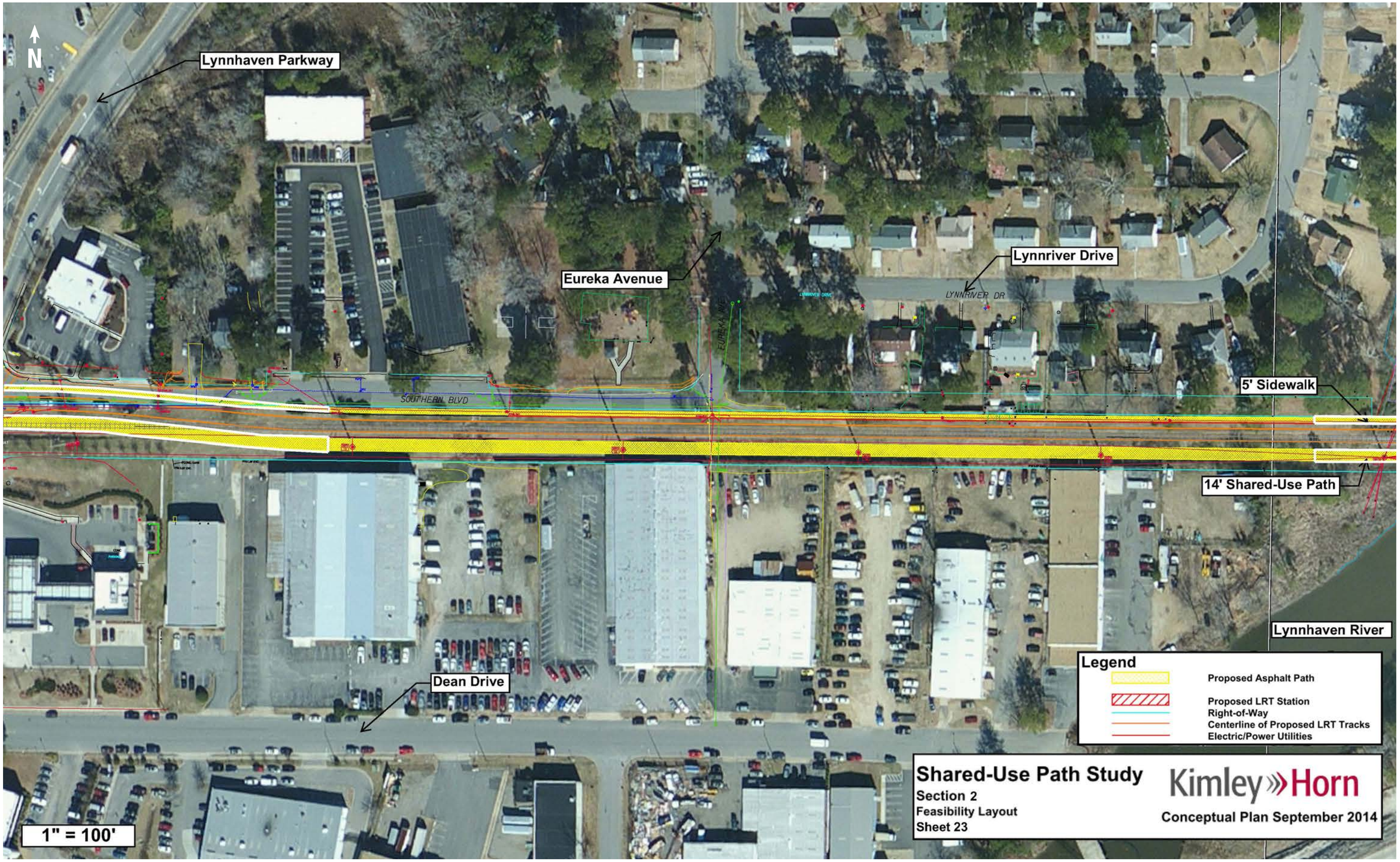
1" = 100'


N
Lynnhaven Parkway
Eureka Avenue
Lynnriver Drive
LYNNRIVER DR
EUREKA AVE
SOUTHERN BLVD
5' Sidewalk
14' Shared-Use Path
Lynnhaven River
Dean Drive
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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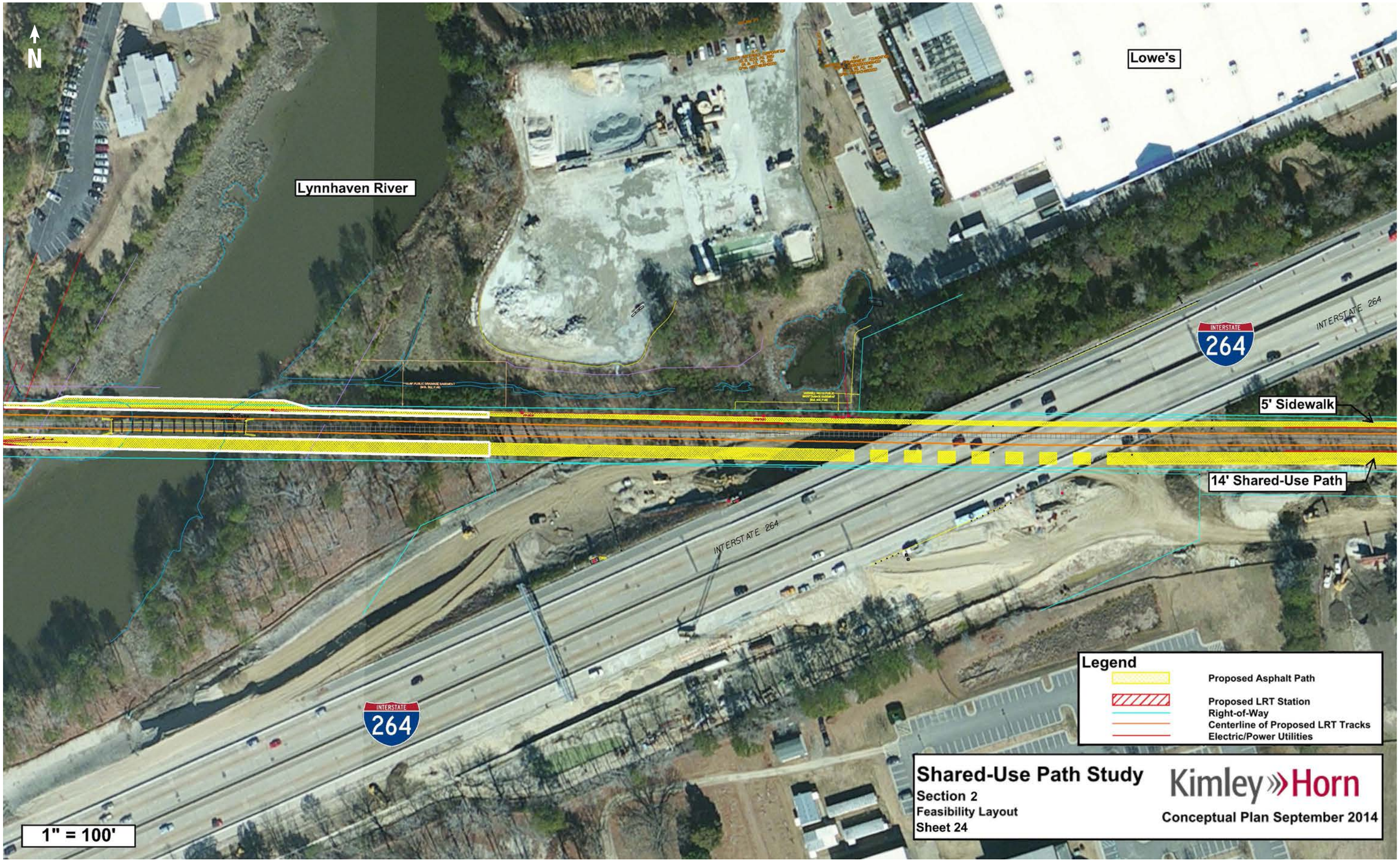
N
Lynnhaven River
Lowe's
INTERSTATE 264
INTERSTATE
264
5' Sidewalk
14' Shared-Use Path
INTERSTATE 264
INTERSTATE
264
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
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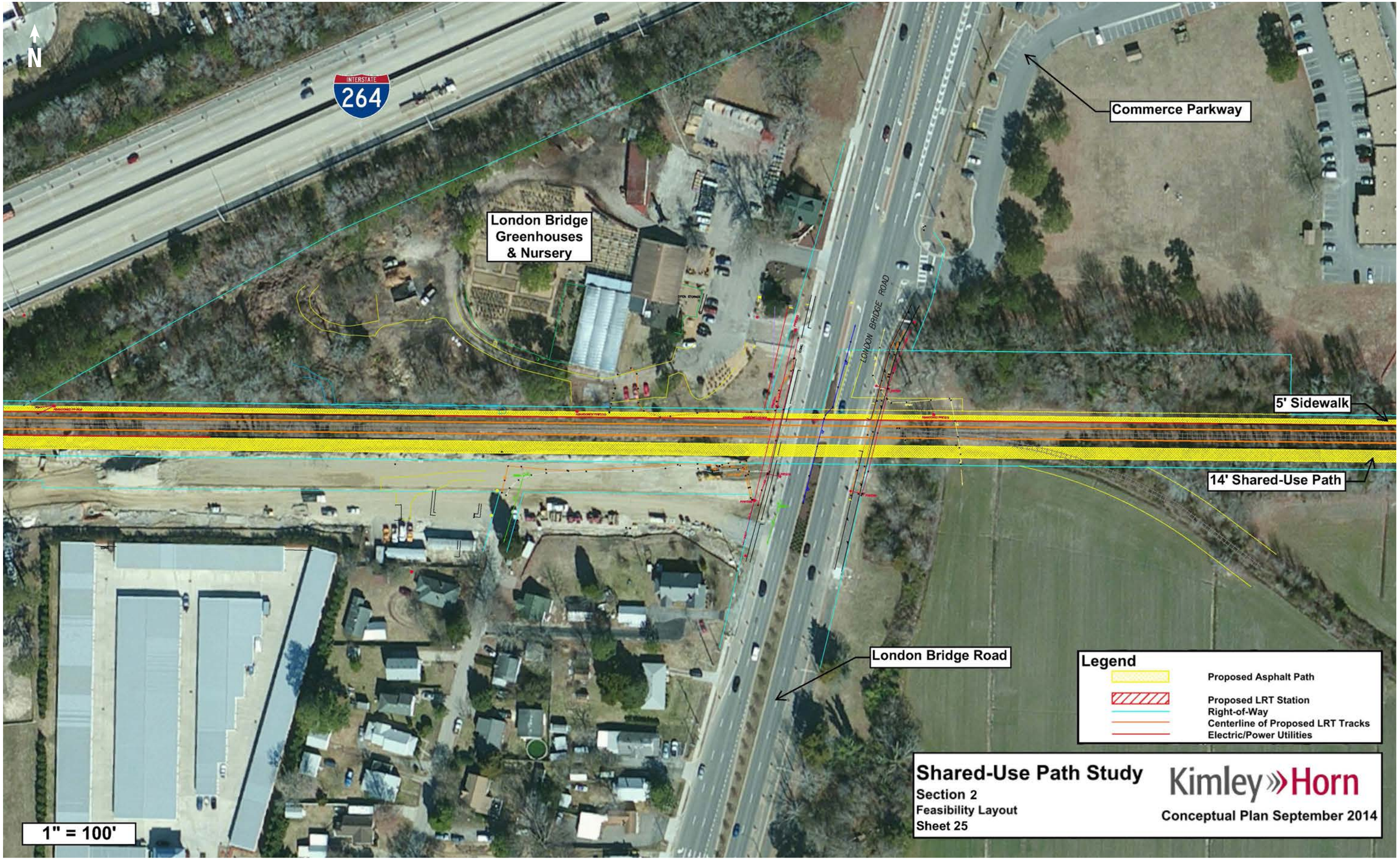
N
INTERSTATE
264
London Bridge
Greenhouses
& Nursery
LONDON BRIDGE ROAD
Commerce Parkway
5' Sidewalk
14' Shared-Use Path
London Bridge Road
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
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London Bridge Road to Norfolk Avenue

From London Bridge Road to the Norfolk Avenue Trail, the former NSRR right-of-way generally runs a straight, east/west path. The corridor consists of residential and commercial development, open space, and some industrial development. Although there is a possibility that the transit alignment will turn north toward the Hilltop area instead of proceeding along the former NSRR right-of-way, it was determined that the desire of this study was to only address the alignment along the former NSRR right-of-way. The City expressed the desire to determine the feasibility of a pathway to fit within the former NSRR right-of-way with transit. For this reason, the path does not meander, and instead continues relatively straight in the east/west direction. See Sheets 26 through 34 for a detailed layout of this area.

Strategic Growth Areas

This section, from London Bridge Road to Norfolk Avenue, begins in the Lynnhaven SGA. Before reaching Air Station Drive, the Lynnhaven SGA limit is crossed and the corridor enters the Hilltop SGA. The vision, as defined by the plan for the Hilltop SGA is to create a convenient, regional retail destination that is within close proximity to the beach. In order to achieve this, the key recommendations include building upon the existing natural resources to expand access to public open space through an interconnected system of parks and trails, and encouraging redevelopment of obsolete commercial structures with new buildings placed according to new urban planning standards for the district. By incorporating a shared-use path in this area, open spaces will be connected and a major trail will be added to the area. This will in turn encourage new development to spur in the surrounding area; the shared-use path system will supplement the vision for the Hilltop SGA.

Street Crossings

The North Oceana Transit Station is proposed north of Potters Road just west of Air Station Drive. The sidewalk and path will connect to the station circulation pattern. There will be a crossing of the path at Air Station Drive and it will be stop sign-controlled.

A major crossing in this section is across First Colonial Road. At this location, there is no existing infrastructure for a controlled intersection. This crossing is recommended to be an at-grade mid-block crossing, incorporating the appropriate signage to allow shared-use path traffic to safely cross the two-lane facility. The current HRT plans show that gates are to be installed to control vehicular traffic when trains approach. The pedestrians and bicyclists can cross when the gates are down and the trains are crossing the road.

The Oceana Boulevard crossing is challenging. The sidewalk and pathway cross Oceana Boulevard not only at a skew, but also in the curvature of the roadway. This causes the crossing to be longer than a perpendicular crossing. There are gates planned if light rail is constructed in this corridor. If that is the case, there will be opportunities for path and sidewalk users to cross when the trains cross. At other times, there will be stop signs on the sidewalk and path to control the pedestrians and bicyclists.

The Sykes Avenue at-grade crossing will be similar to other smaller-street treatments. The sidewalk and shared-use path will continue across the roadway parallel to the tracks and the users will be controlled by stop signs on the sidewalk and path.

The next major road along the corridor is Birdneck Road. There is an existing traffic signal at this location; this will act as the terminus for the proposed shared-use path. Users can access the existing street crossings to cross Birdneck Road, and will be able to continue to the Norfolk Trail system along Norfolk Avenue.

Transit Stops

The only proposed transit station is the North Oceana Station, located west of Air Station Drive. The next proposed transit station is outside the limits of this study. The North Oceana Station proposes a designated park-and-ride area.

Drainage

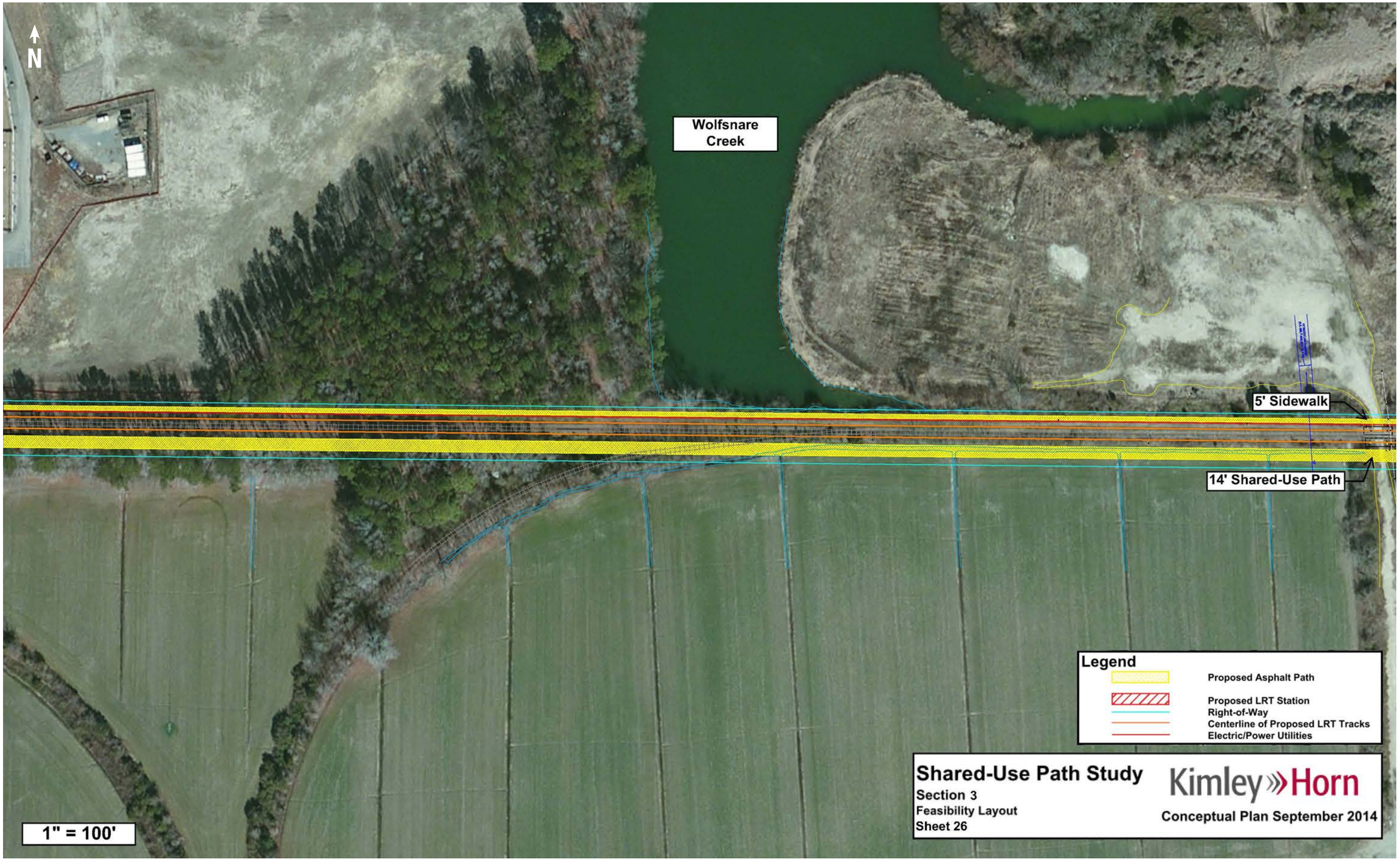
From London Bridge Road to Norfolk Avenue Trail, the existing corridor uses an open ditch drainage system. Generally, there is a minimum of 7 feet of separation between the proposed edge of path and right-of-way line. As mentioned in other sections, the proposed path will pave over the existing ditch, requiring the drainage strategy to be revisited.

The potential main outfalls identified between London Bridge Road and Norfolk Avenue Trail are Wolfsnare Creek and Great Neck Creek. There are various existing ponds upstream of Wolfsnare Creek; taking advantage of these existing BMPs could be useful in treatment of stormwater runoff from the path. Currently, the City owns a parcel to the east of Wolfsnare Creek, GPIN 24073469160000, which could be used for connectivity to existing BMPs or placement of supplemental BMPs. If this parcel were used, no cost would be associated with purchasing additional right-of-way. Great Neck Creek could likely also be used as a main outfall. If additional space for BMPs is required, it would be advantageous to have space on either side of the creek. The City owns a parcel on the southeast side of the creek, GPIN 24173396820000. The City also owns a parcel on the southwest side, GPIN 24172410800000. Use of these parcels would again avoid purchase of additional right-of-way.

Using these outfalls, the same recommendation is proposed: the use of shallow wet or dry swales with an underground piped drainage system as needed. Wet or dry swales will help to account for water quality and quantity. Rock check dams may also need to be used to meet quantity requirements. If this BMP is not sufficient, using permeable pavement for the sidewalk and shared-use path is an option as a supplemental BMP. However, for a portion of this section, the edged of the proposed path and the right-of-way line have only 2 feet of separation. In this area, underground drainage will likely need to be considered. There is an existing storm sewer system along Southern Boulevard that may be able to take on the additional flow from the path.

Preliminary Opinion of Probable Cost

Based on the conceptual level of the study, this section of the project is estimated to cost $5.6 million. There are no elevated crossings or water crossings along this 2.8 mile section. This yields a cost per mile of about $2.0 million. This is the lowest cost per mile of the three proposed sections.


N
Wolfsnare Creek
5' Sidewalk
14' Shared-Use Path
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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Feasibility Layout
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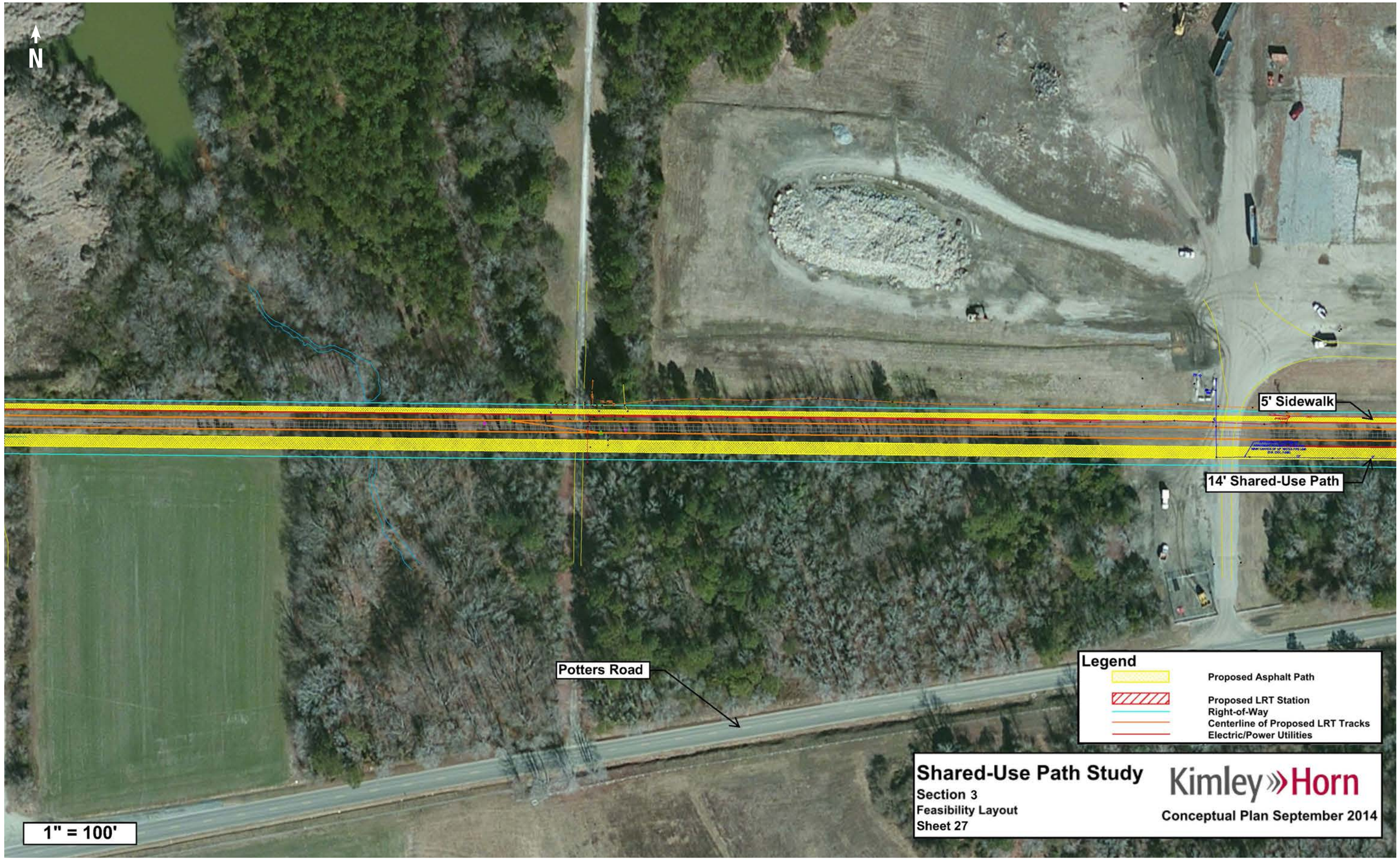
N
5' Sidewalk
14' Shared-Use Path
Potters Road
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 3
Feasibility Layout
Sheet 27
Kimley»Horn
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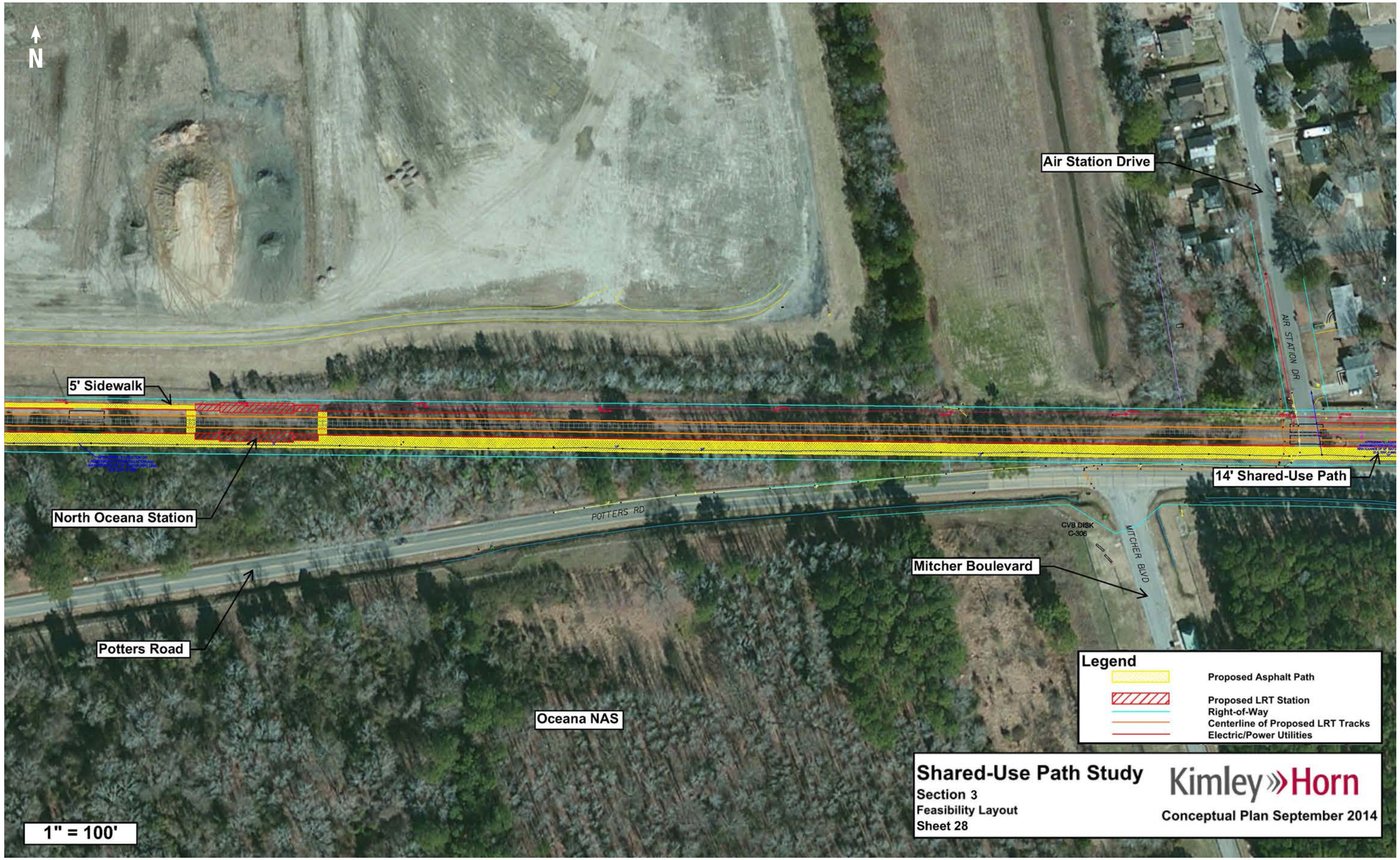
1" = 100'


N
Air Station Drive
5' Sidewalk
14' Shared-Use Path
North Oceana Station
POTTERS RD
CVB DISK
C-306
MITCHER BLVD
Mitcher Boulevard
Potters Road
Oceana NAS
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
Section 3
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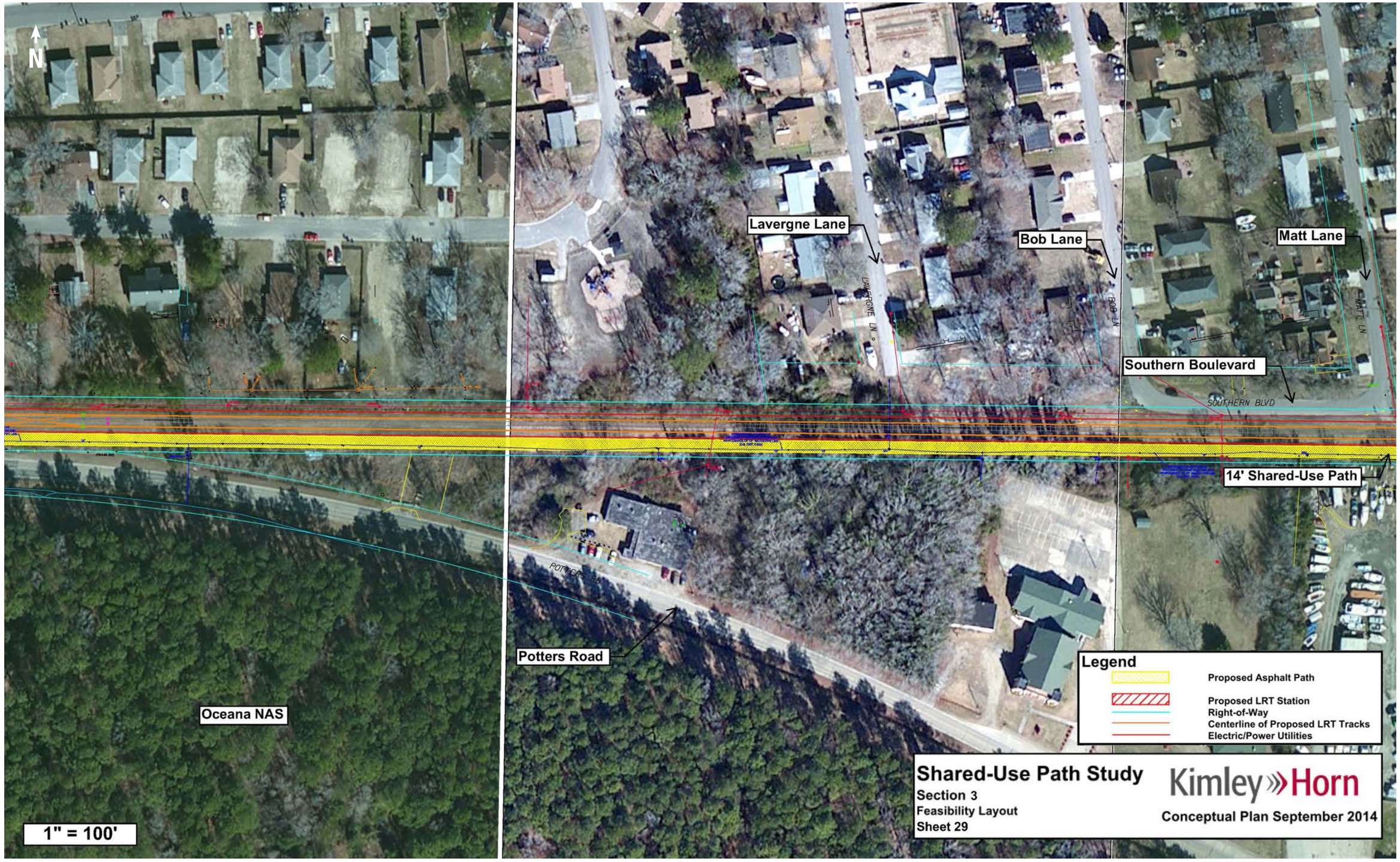
N
Lavergne Lane
Bob Lane
Matt Lane
Southern Boulevard
14' Shared-Use Path
Potters Road
Oceana NAS
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
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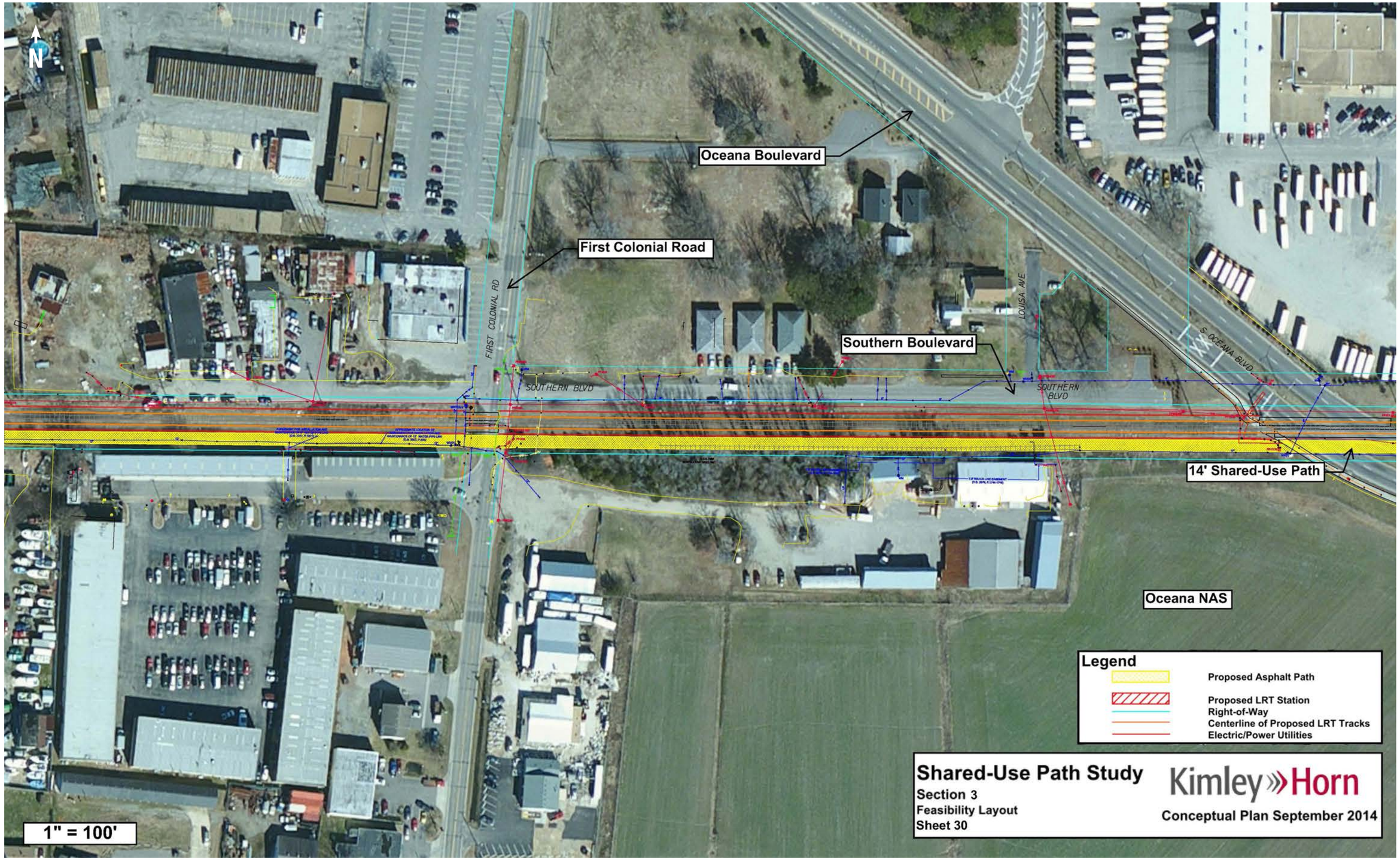
N
Oceana Boulevard
First Colonial Road
Southern Boulevard
FIRST COLONIAL RD
SOUTHERN BLVD
LOUISA AVE
SOUTHERN BLVD
S. OCEANA BLVD
14' Shared-Use Path
Oceana NAS
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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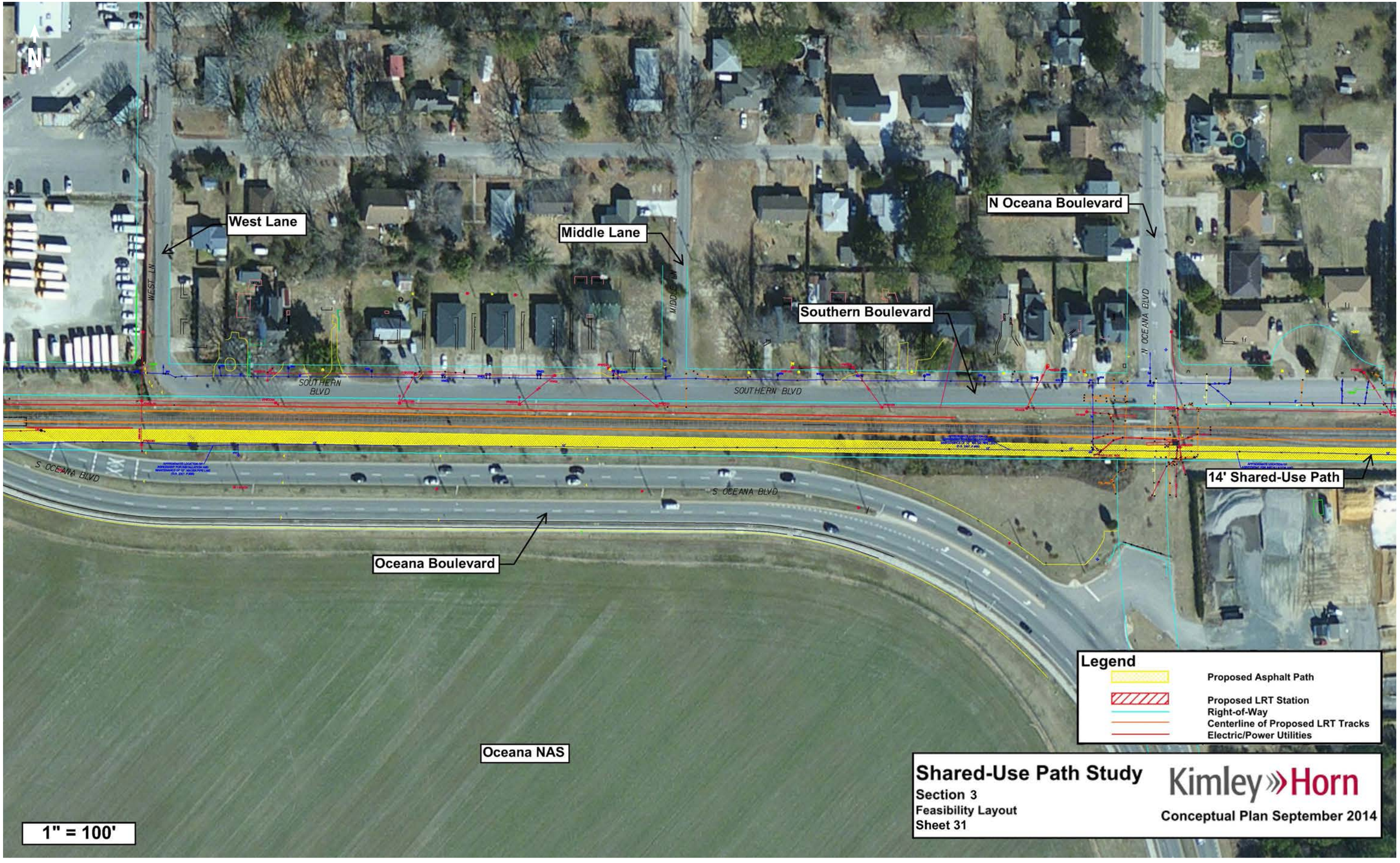
N
West Lane
Middle Lane
Southern Boulevard
N Oceana Boulevard
WEST LN
MIDDLE LN
N OCEANA BLVD
SOUTHERN BLVD
SOUTHERN BLVD
S OCEANA BLVD
S OCEANA BLVD
14' Shared-Use Path
Oceana Boulevard
Oceana NAS
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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N
Oceana Self Storage & Office
Pick-n-Pull Auto and Truck Dismantlers
Sykes Avenue
Southern Boulevard
SOUTHERN BLVD
SYKES AVE
S SYKES AVE
14' Shared-Use Path
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
Electric/Power Utilities
Shared-Use Path Study
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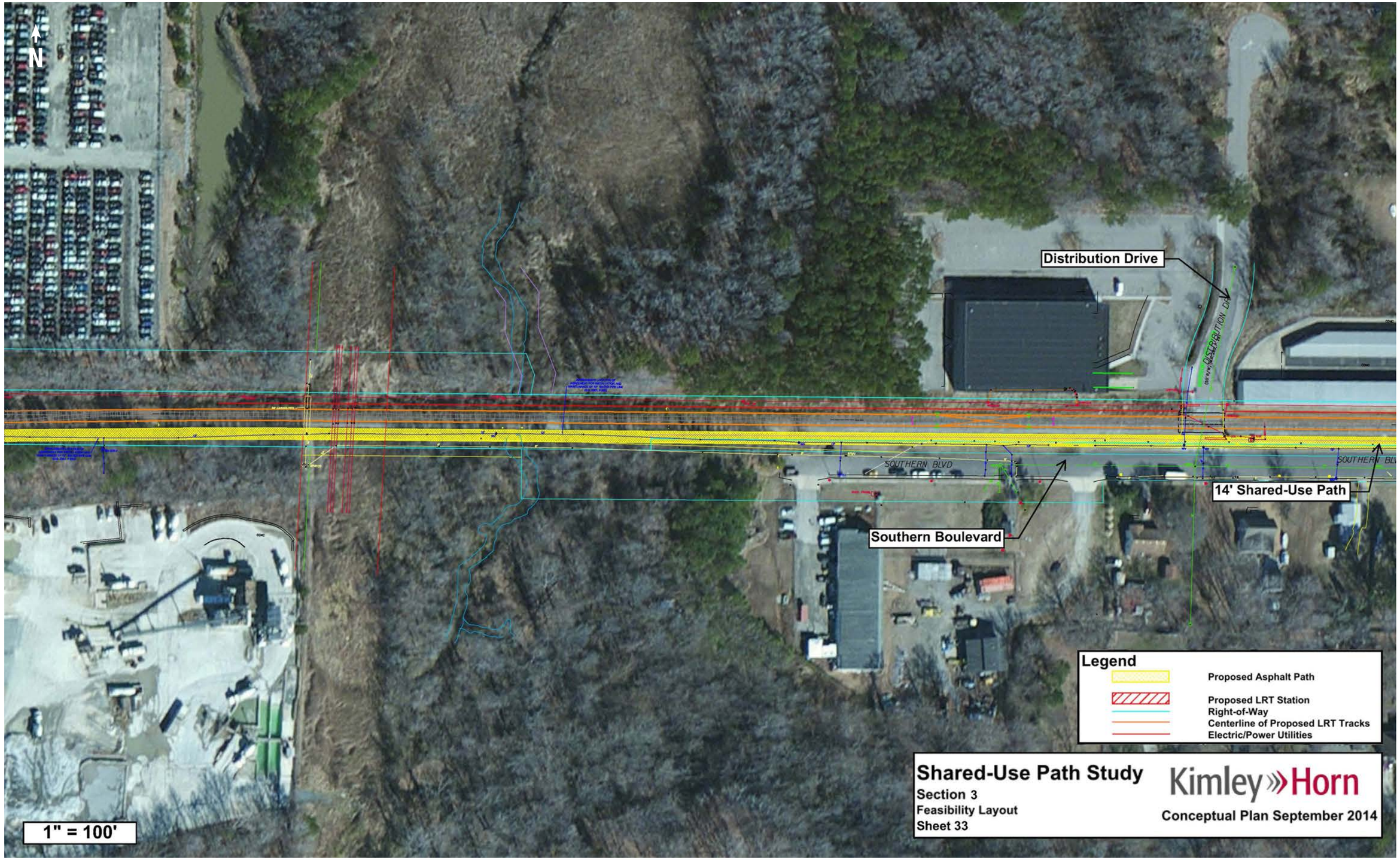
1" = 100'


N
Distribution Drive
DISTRIBUTION DR
SOUTHERN BLVD
SOUTHERN BLV
Southern Boulevard
14' Shared-Use Path
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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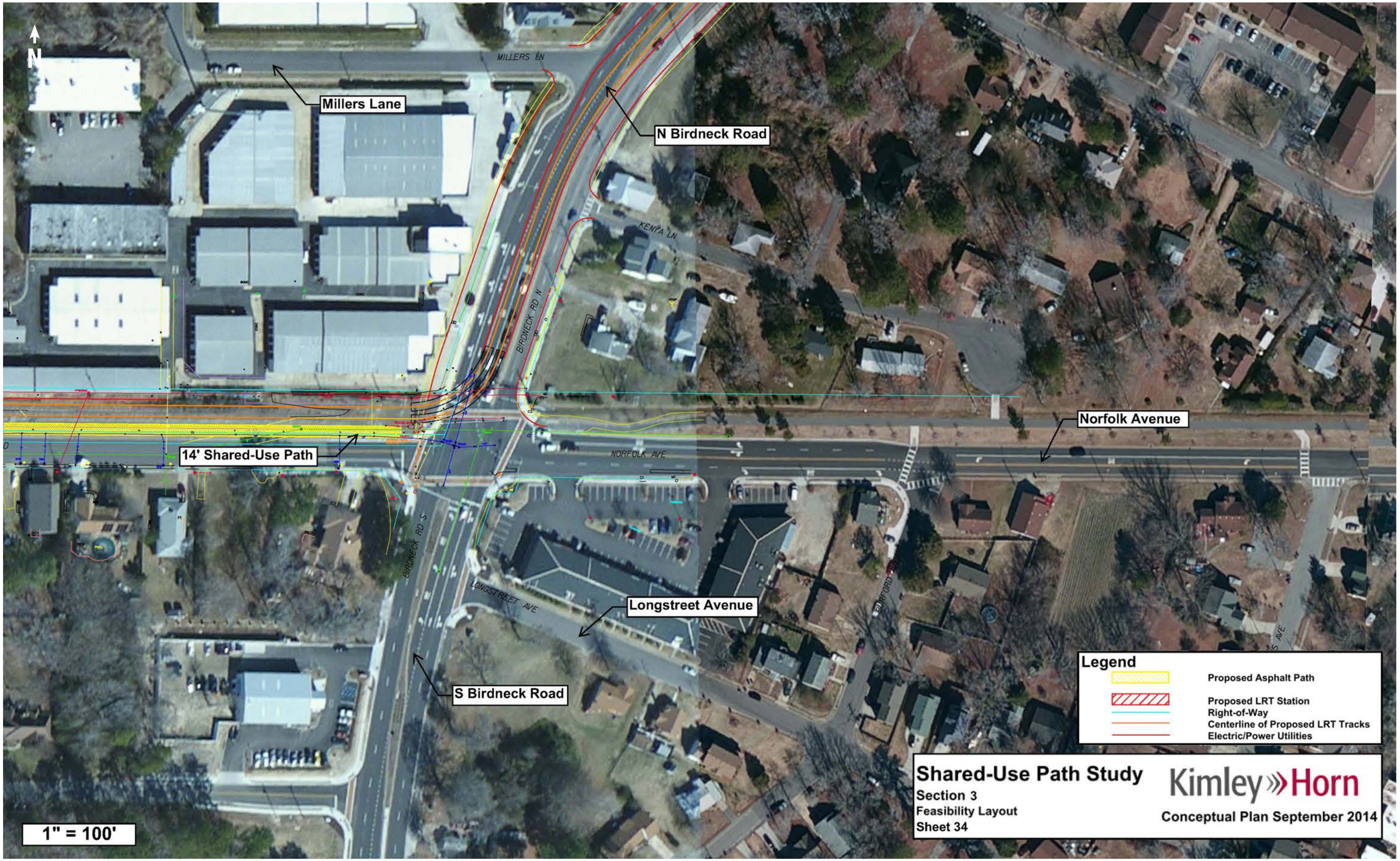
1" = 100'


N
Millers Lane
N Birdneck Road
Norfolk Avenue
14' Shared-Use Path
Longstreet Avenue
S Birdneck Road
MILLERS LN
KENYA LN
BIRDNECK RD N
NORFOLK AVE
BIRDNECK RD S
LONGSTREET AVE
1" = 100'
Legend
Proposed Asphalt Path
Proposed LRT Station
Right-of-Way
Centerline of Proposed LRT Tracks
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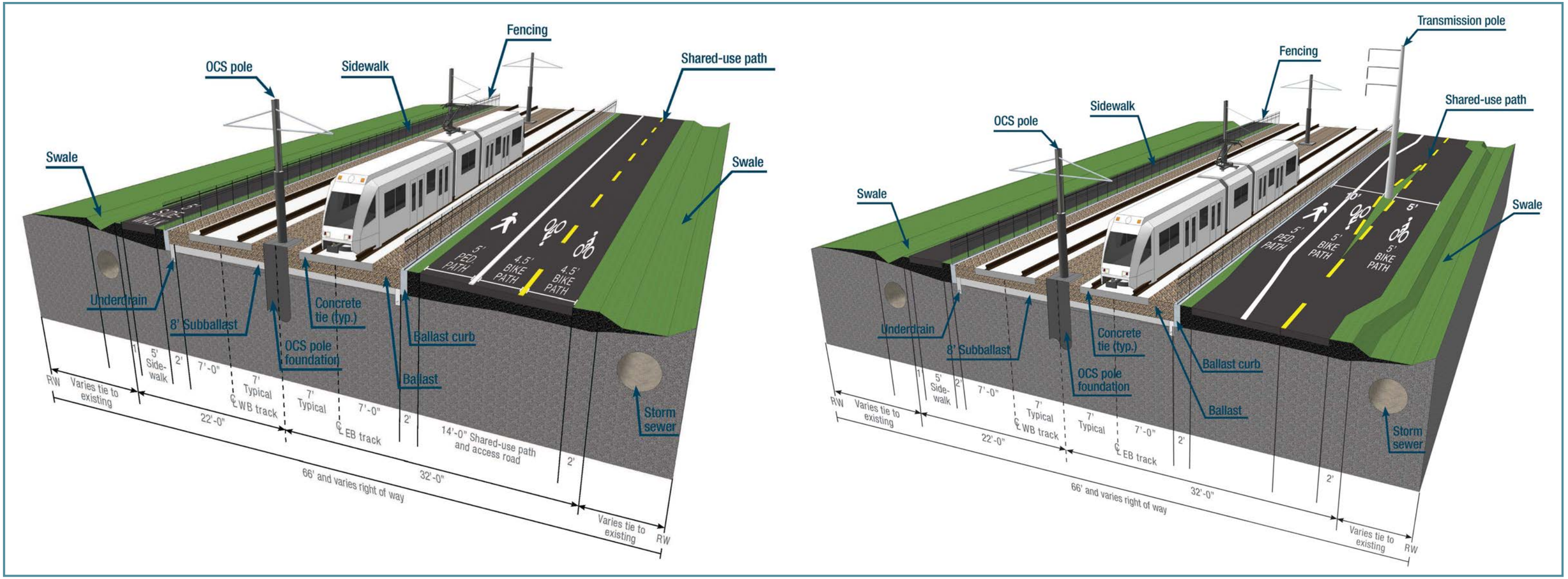

Figure 18: Typical Section – 5-foot sidewalk and 14-foot shared-use path

Summary

The overarching concept of this study was to define, at a conceptual level, if a facility could be incorporated within the former NSRR right-of-way that would connect proposed transit stations, while simultaneously acting as a pedestrian friendly connection between Strategic Growth Areas throughout the City of Virginia Beach. With very few areas requiring acquisition of right-of-way or permanent easements, a 5-foot sidewalk and 14-foot shared-use path was determined to be the best option in **Figure 18**. This alternative requires only one, 700-foot section of the path to be outside of the LRT corridor, following a parallel route along Southern Boulevard east of Witchduck Road. The recommended typical allows space for shallow swales and a piped drainage system. The 10.5 mile facility incorporates a total of 11 mid-block crossings, two water crossings, and three elevated structures. At a preliminary level, the total project construction cost is estimated to be $54.1 million, yielding an overall cost of $5.1 million per mile.

What's Next

This preliminary study was intended to determine if a shared-use path along the proposed transit alignment is feasible. At a conceptual level, it is possible to begin a framework for a shared-use path system, with intent to continuously develop and improve the facility over time. The project will require cooperation of various entities, including the City of Virginia Beach, Dominion Virginia Power, Hampton Roads Transit, and the development community.

The next steps in development of the shared-use path will constitute much more in-depth, design level work. It will be important to incorporate the opportunities and constraints outlined in this report to design an effective pathway. Developing a study on north/south connections and connectivity at specific transit stations will also be a key aspect of the success of the path system. To make this project a reality, the study will need to be approved and adopted into the master plan. Funding will also need to be identified before taking steps to include the project as a part of the City of Virginia Beach Capital Improvement Plan.

This project aligns with the goals and visions for the City's SGAs. The shared-use path will create an east/west connection through six of the City's SGAs, enhance development, and act as an amenity to the residents and visitors of the City. With strategic design, this pathway system will greatly enhance the development of the City of Virginia Beach.

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